No. XIII.

Description of a New Genus of the Family of Naïades, including Eight Species, Four of which are New; also the Description of Eleven New Species of the Genus Unio from the Rivers of the United States: with Observations on some of the Characters of the Naïades. By Isaac Lea, M.A.P.S. M.A.N.S.P., &c. Read March 6th, 1829.

I HAD the pleasure to present to this Society in November, 1827, a description of six new species of the genus Unio, which they did me the honour to publish. Since that period I have continued to collect and examine the genera of the family of *Naïades* with great interest, and more success than I could have anticipated. I propose in this paper to describe fifteen new species, a number which rarely falls to the lot of a naturalist at one period; and I shall previously indulge myself in some observations respecting their characters, habits, &c.

Strong objections have been made to the study of conchology by persons unacquainted with this branch of zoology, and it has been alleged that a collection of shells is merely a collection of the houses or habitations of an animal carefully removed by the naturalist or destroyed by other causes, and therefore unworthy the time and attention of the student of nature. This assertion betrays ignorance, and recoils on the observer; for it may with truth be said, that no part of the

works of nature, however minute or unimportant to the passer by, can be examined without creating in the student of nature the utmost wonder and astonishment.

In this class of animals nature seems not to have worked with the hand of a stepmother; she put them out of her lap after having lavished her bounties upon them in the utmost profusion. All the tints and combinations of the colours of the rainbow are called to adorn their coverings; and in the form of the shells we have almost all the figures that the science of geometry can present. Who can watch the common snail of our woods, and see him commence at a mere point, from which he builds his covering by a secretion from his own body and turns it with the most mathematical exactness, without exclaiming, Thou art indeed a great geometrician! and when he comes to finish his arched entrance, graced with a curvation pure and as white as marble, who can refuse to acknowledge him an accomplished architect?

In viewing the covering of this class of animals, I consider it as in some measure analogous to the skeleton in the vertebral animals. The muscular attachments, of which there are many, to the two valves of the conchifera, may be viewed as the attachments of the muscles of the animal frame to the bones, by which we are enabled to enjoy locomotion. The ligament, which firmly connects, exteriorly, the two valves, may be assimilated to those ligaments whose almost exclusive service is to connect some of the important bones of the human skeleton.

Is it reasonable to consider the valves as merely a habitation for the animal? Are they not always acting a more distinguished part? The ligament, beautifully formed of a combined horny and fibrous substance, is ever in action while the animal lives, and this action is counterbalanced by the contraction of the muscles attached to the interior of the valves. The epidermis too has its duty to perform in protecting from decomposition the calcareous matter of the shell. It is composed of a thin horny substance—somewhat like that of the exterior part of the ligament. The prolongation of the epi-

dermis beyond the margin of the shell seems well adapted, when the animal closes the valves, to exclude the entrance of water, &c., and doubtless is thus used.

When a conchologist examines a shell which to him is new, almost the first question he puts to himself is, "what must be the form of the animal which once inhabited this covering?" He judges by analogy; and after examining the form of the shell, he has generally a very good idea of its former inhabitant, and although he may not be able to decide with the same precision as the osteologist, he can place it in its proper family.

Each family has a form of shell adapted to the wants of its inhabitant, and peculiarly fitted for its locomotion or its fixed situation. Thus the Ostracea could not exist in the shells of the *Naïades*, although the forms of the animals are not very dissimilar to the unpractised eye. The naturalist, however, sees in the former the entire want of the muscular foot for locomotion and its attendant pairs of muscles. In the valve of this he sees but one muscular impression, which muscle is used for the sole purpose of closing the valves, while in the other he sees at least four, two of the muscles of which are used for protruding, the other two for retracting the foot by which it propels itself. The species of the family Mytilacea attach themselves by a strong byssus to stones, &c., and therefore require a very differently constructed shell. The Lithophaga bore into stone, wood, mud, &c., and have no power of locomotion. The Solenacea generally live in pits, and move only between the two extremities of them. To these families might be added many more, all of which are as different in form and habits, as can well be imagined. It may therefore be safely asserted that the student of conchology can always form some idea of the animal from the form of the shell.

My attention having been particularly drawn to the study of the family of the *Naïades*, and my cabinet possessing a great number of species and varieties, I feel induced in this preliminary matter to say something on the species of the

Uniones, described by naturalists who have written on our shells.

The genus Unio presents in the waters of the United States, particularly in the rivers west of the Alleghany mountains, a number of species almost extending beyond belief. Nature has scattered them here with the hand of profusion, after having formed them with the most harmonising beauties.

The number of the species adds greatly to the difficulty of distinguishing them, for they glide into each other so insensibly through their varieties, that the most experienced are often at fault and perplexed with the difficulty of placing them properly in the most approved systems*. But, although we may at every step meet with these difficulties, I cannot suppose that most of those described as species do not exist; the fault has been that mere varieties, in the eagerness of authors to make species, have too often been erected into species, and the great Lamarck has committed this error in as great a degree as almost any other writer.

It is the opinion of some eminent conchologists that the family of the *Naïades* possesses but one genus, and that the genera into which it is at present divided are only species, and the species varieties. Were we to adopt this division, we should be in a worse dilemma than before; for we can scarcely imagine bivalves more different from each other in form than are some of our trans-Alleghany species of Unio.

How totally different is the *rectus* of Lamarck from the *irroratus?* (nobis). The first is four times the width of its length, whilst the latter is longer than broad. The one is broad rayed, in fine specimens; the other possesses dotted lines universally. The *triangularis* of Barnes is entirely dissimilar to the *nasutus* of Say, as is also the *circulus*, herein described, from the *lanceolatus* (nobis); and the same may be said of *peruvianus* and *pictorum*. Two species could

* Swainson says, "Indeed so much uncertainty hangs on the shells of this genus, that the species can only be fixed by ample descriptions and very correct figures."—*Zool. Illus. Vol. I. t.* 57.

be scarcely more unlike than the smooth and radiated *siliquoideus* of Barnes and the beautiful tuberculated *lacrymosus* (nobis); and the same remark may be applied to the *cylindricus* and *alatus* of that excellent conchologist Mr Say. Many other species could be thus contrasted, but I deem the above sufficient, upon examination, to prove the justness of my remarks, and the necessity, in the present state of our knowledge, to retain the species, whatever may be the changes in the genera*.

In a preceding paper on the Uniones I said something on the habits of the animal. I wish now to mention the simple fact that I have kept several specimens about ten months in a basin changing the water every five or six days. During this period they passed through the winter without any change in their usual habits, and nothing in the shape of food was given during the whole period.

This truly interesting family presents us with very difficult specific characteristics, rendered so by the species constantly approaching in similitude to each other, and by the change made in them by age, locality, and exposure.

I propose to offer a few observations on the principal characters, in which it will be seen how little we can depend on any one of them, and shall begin first with the teeth.

Teeth. In the species of the Unio these have been used as

* In a letter addressed to me by William Cooper, Esq., an intelligent naturalist of New York, he says, "There are now, I think, not less than thirty North American species of Unio well established, and perhaps seven or eight more. That they are species, each perpetuating its peculiar form, subject to certain variations, but permanent within fixed limits, seems to me the most rational opinion, although some of our most judicious naturalists think otherwise. Your account of the animal of the *U. irroratus* affords a strong argument in favour of this belief, for it proves that to be beyond doubt as distinct a species as any in any class of animals. Yet this may always be known with certainty by the shell, which, though so well characterised, is not, however, more different from the rest of the genus, than they are from each other, and frequently still less so. If, therefore, this difference is found to be constantly indicative of a species in one instance, it must also be in others. I believe that our lakes and rivers contained the same form of shells at the creation and ever since that they do at this day. If they are hermaphrodite per se, as is said of them, it could not be otherwise; and if the contrary were admitted, natural history would not deserve the name of a science."

strongly characteristic, but we cannot place much reliance on this character, unless accompanied by and dependent on others. Thus, the angle of the cardinal tooth depends much on the location of the beaks, and we know that in the same species the location is quite different, and yet this difference is not worthy of creating even a variety. If the beaks be placed immediately over the anterior margin*, as in the *ellipsis* they generally are, then the cardinal tooth will be nearly or quite parallel to the lamellar one; but if the beaks be more posteriorly placed, then the cardinal tooth becomes more oblique. We must, therefore, when characters are so difficult, look at them in combination, and adopt them with due consideration.

In the same species the mass or substance of the valves varies much according to localities. Thus we find the *complanatus*† in some of our Atlantic rivers full grown, when only an inch broad, while in other of our Atlantic rivers we have them four inches broad. In some localities we have them possessing but little calcareous matter, while in others they are almost massive. This also occurs in perhaps a greater degree with some of the western shells. And if we examine a massive specimen, we are almost sure to find the cardinal teeth more or less thick, whilst those of the same species which are thin, and they frequently differ very much in this respect, will be found to possess cardinal teeth of quite a crested structure. The cardinal tooth, being single in one and double in the other valve, or double in both valves, cannot be depended on as an unfailing character. The same species will often present double teeth in both valves, although it may be usual to possess them in the right valve only. The lamellar tooth depends much on the substance of the specimen. If it be massive the teeth will be thick, if thin more bladed; the teeth, therefore, differ almost as much in varieties as in species. We must, consequently, while examining a specimen to determine its species, give due attention to these counteracting characters.

* I reverse Lamarck's anterior and adopt Cuvier's as heretofore.

† *Purpureus* of Say.

Colour. The colour of the Uniones is generally a deceptive character. This, however, is not always the case, and therefore it deserves the attention of the conchologist. In some species it is permanent in the nacre, in others it is permanent in the epidermis. In the following species I have always found the nacre to be white and pearly, viz. *cornutus*, *tuberculatus*, *siliquoideus*, *ventricosus*, *ovatus*, *triangularis*, *parvus*, *plicatus*, *metanever*, *æsopus*, *scalenius*, *cylindricus**, *lacrymosus*, *irroratus**, *ellipsis*†, *donaciformis*, *calceolus*, *heterodon*, *multiradiatus*, *occidens*, *securis*‡, *iris*, *zig-zag*, *patulus*, and *planulatus:* the last eight herein described. In the "*torsa*" of Rafinesque, and *sulcatus* (herein described), the purple is permanent and generally dark. In the *subtentus*, *lanceolatus*, and *rubiginosus* (herein described), it is a pale salmon colour, and in the *ater* (herein described) it is a pink bordering on purple. The *gibbosus* is generally a dark purple or chocolate, but varies from this through all the intermediate shades to perfect white. The *verrucosus* is either chocolate or white, and does not seem to enjoy the intermediate tints. The *circulus* (herein described) is generally of a pure pearly white, but sometimes, though rarely, possesses a blush of pink in the centre of the valve. The *mytiloides* presents all the shades from the deepest flesh colour to the purest white. The *cariosus* is generally white, but sometimes is found of a deep salmon and the intermediate shades. The *nasutus* is either pearly white or approaching salmon colour under the beaks. The *rectus* is generally of a beautiful porcelanic white, sometimes tinted about the cardinal teeth and in the cavity of the beaks with purple

* The *cylindricus* and *irroratus* sometimes, in very perfect specimens, present a slight golden appearance in the nacre at the anterior margin.

† Var. *a* being herein described as a new species.

‡ This is Rafinesque's "*U. depressa*," but the name being preoccupied by Lamarck, apparently without the knowledge of Mr R., I am compelled to give it a new name or leave it out of the catalogue. I prefer the former alternative, as it is a distinct and beautiful species, and well known to most of our conchologists under its duplicated name "*depressa*." In this I act in accordance with the rules of nomenclature in natural history. See description.

or salmon, more generally the former: specimens are rarely found with the nacre entirely coloured. The *complanatus*, of which so many false species have been created by European naturalists, presents us with more colours and shades than any other species except the *cuneatus* of Barnes, which by many conchologists is considered analogous to it. These two species present us with specimens of the darkest purple, the purest white, the richest salmon, and all their intermediate shades. The fine indistinct striæ of the nacre, which are sometimes observed to diverge from the interior of the beak to the margin, are caused by the successive removals of the marginal attachment of the mantle.

It should be borne constantly in mind that the colour of the nacre is an extremely doubtful character in the family of *Naïades;* in exemplification of which I have an Anodonta from the Ohio, *the nacre of one valve of which is salmon and the other white.* The valves are beyond all doubt of the same animal. The green irregular spots and marks sometimes described to exist in our Uniones deserve no attention, as they are altogether accidental, perhaps the effect of disease: they are more frequent in the *rectus* and *cylindricus.*

Elevations on the surface of the disks. These are sometimes tuberculated, sometimes undulated; and our western waters are the only ones we know of which produce many species thus marked. There they exist in great variety and exceedingly great beauty. The *U. tuberculatus* and *U. lacrymosus* possess more tubercles than any other species. The *U. verrucosus* possesses them irregularly scattered over the sides of the valves. The *U. metanever* and *U. cylindricus*, besides the irregular elevations over the disk, have remarkable undulations along the umbonial slope*, from the beak to the margin. The *U. cornutus* is furnished with three or four protuberances or "horns" in a row, passing from the beaks direct to the basal margin; the varieties of the *cornutus* have these

* I use this term for the elevated *ridge* which passes from the beaks to the posterior margin.

"horns" more depressed and more frequent, and thus pass into varieties with a mere furrow without any distinct elevations, and these gradations are almost innumerable. The *irroratus* has slightly elevated tubercles along both sides of the furrow; these are sometimes continued along the wrinkles, making them elevated. The *æsopus* has a "nodulous ridge" over the middle of the shell, and the *plicatus* has folds or waves over the posterior part of the disks, more or less numerous, and which are so large as to produce an irregular effect through the nacre in many instances.

The epidermal colours of this family are exceedingly circumscribed. The ground varies from deep fuscous or black to pale yellow, frequently passing through obscure green, rarely bright green. This ground is intersected frequently with rays or spots of a darker hue. In fine and perfect specimens these are generally perceptible, sometimes eminently beautiful. In imperfect or old specimens these marks are almost always obliterated. The following species, when the specimens are perfect and fresh, occur beautifully painted with rays more or less broad: viz. *complanatus*, *cuneatus*, *radiatus*, *siliquoideus*, *ventricosus*, *ovatus**, *cariosus*, *nasutus*, *lacrymosus* (very slightly), *calceolus*, *rectus*, *ochraceus*, *heterodon*, *sulcatus*, *multiradiatus*, *occidens*, *iris*, and *zig-zag*.

The *securis* is rayed in a manner peculiar to itself. (See description.) The *cornutus* has beautiful hairlike lines, sometimes minutely waved, which diverge to its entire margin. Some of the varieties have no rays, while others have comparatively broad and beautiful ones. The *sulcatus* is indistinctly rayed over the umbones†, but the furrow passing from the beaks to the posterior basal margin has many hair like lines,

* Mr Say says this shell is "not radiated." This is generally the case: but some specimens are beautifully rayed; and Lamarck says of his var. *b*, "testâ radiis longitudinalibus pictâ."

† I use this term as Linnæus did: it is the "*ventre*" of the French writers. Draparnaud says, "la portion la plus renflée des valves." It is improperly used by English writers denoting the beaks or summits.

which are minutely waved; these lines are continued over the umbonial slope. The *irroratus* is covered over the whole disk with dark green spotted lines, running in a sweep from the beak to the margin and lying close to each other.

The following species have broad interrupted rays, which in some instances make rows of square spots: viz. *planulatus*, *scalenius*, *verrucosus* (when young), and *patulus*.

The *donaciformis* and *zig-zag* have diverging rays formed more or less distinctly by zig-zag lines. The *cylindricus*, *metanever*, and *triangularis* are singularly and most beautifully marked with dark green spots in the form of an arrow head, the point directed to the margin. The first and last possess the most; in the others it can only be distinguished in very fine or young specimens. The marks sometimes exist in a confluent state, and rays are consequently produced. They are most prevalent in the *cylindricus*, and vary from the length of a quarter of an inch to a mere point; in the *triangularis* they are more generally confluent. Some specimens of *cylindricus* are so much charged with these arrow-headed marks as almost to obliterate the yellow ground of the epidermis, and cause the valves to appear at first sight of an uniform dark green.

The remainder of the American species described are without epidermal markings, and I shall divide them, as it is extremely difficult to designate their shades, into blackish, brownish, and yellowish. The *ater*, *tuberculatus*, *circulus*, and *gibbosus** are blackish. The *circulus* is peculiar in having the posterior slope yellowish. The *parvus*, *torsus*, *plicatus*, *mytiloides*, *æsopus*, *subtentus*, *verrucosus*, *ellipsis*, *rubiginosus*, are brownish. Some of these, however, vary much. The *torsus* is found sometimes yellowish, and when young almost black; the posterior slope is, however, universally yellowish. Large and old specimens of the *plicatus* are quite black; the young are light brown. In the *mytiloides*

* The young *gibbosus* is sometimes very obscurely rayed.

the young specimens are sometimes rayed over the umbones. The young *æsopus* is bright yellow and highly polished. The young *verrucosus* has sometimes one or two broad interrupted green lines over the middle of the umbones. In young or very perfect specimens of the *ellipsis* may be seen numerous small rays passing over the umbones towards the posterior margin. In the younger specimens of the *rubiginosus* indistinct rays are sometimes seen. The *lanceolatus* is yellowish passing into olive.

It should ever be borne in mind, notwithstanding what has been said above, that colour is exceedingly deceptive, and may often lead to error. It is impossible to find permanent characteristics in it, on which we can universally depend, as locality, exposure, youth, and age so materially affect its appearance. We must therefore consider it in most cases as only auxiliary, though in a few cases it is permanent.

Beaks. Lamarck, in his generic description of the Unio, says, "natibus decorticatis, suberosis." This character is not permanent by any means in our species, some of which are almost universally found free from decortication, while others are partially so; and others again rarely free from it. The objection to receiving it as a permanent character even in species is, that more or less exposure to the action of the stream, &c. will cause the beaks to be more or less eroded in the species where erosion takes place. Some species, however, seem to resist this erosion with great success, owing, as I apprehend, to the peculiar firmness of the texture of their epidermis, which certainly differs in different species. I have never seen either of the following species eroded, viz. *U. parvus*, *U. calceolus*, *U. lacrymosus*, *U. rubiginosus*, or the *Symphynota lævissima* (the two last herein described). It is rarely we see a ponderous shell free from this erosion, and the *U. cylindricus* seems to be peculiarly subject to it, for the form of the beaks can rarely be even traced, yet the largest specimen in my cabinet, nearly five inches broad, possesses the epidermis untouched on this part. The beaks of many of the species, when found in a perfect state, are crowned with concentric

undulations or slight elevations, which should always be noticed, as they are highly characteristic. The situation of the beaks, when peculiar, should have the student's attention. They are sometimes almost medial, as in the *U. irroratus*, *U. circulus*, *U. lacrymosus*, *&c.;* while in the *U. ellipsis*, *U. scalenius*, *U. cylindricus*, *Symphynota tenuissima**, *&c.* they are almost terminal: this character, however, varies. (See observations on the teeth.)

The *margins* or circumference should have our attention in examining a specimen. The general form of the *Naïades* is ovate, modified into rhomboidal, triangular, circular, and elliptical; but these forms in the same species will frequently vary, and therefore must not be entirely relied on. The *U. siliquoideus* is generally subangular posteriorly, but it is sometimes truncate, and the *U. cariosus* is found in the same way. We find very few species that are constant in this character; this accounts for the many species created from the *U. pictorum* in Europe.

Muscular impressions. These are important, and should always have our attention in examining a specimen. But even this character is not infallible. It should be understood that the animals of this family always possess two pairs of muscles, used for locomotion, and placed near or in contact with the two adductor muscles, used solely for closing the valves†. In the anterior margin these are generally separate, in the posterior more generally confluent; but in the same species we sometimes find individuals presenting two, sometimes three, and sometimes four cicatrices, besides those of the cavity of the beaks; and this depends in a great measure on the thickness of the shell. If the specimen be ponderous, we often find the posterior muscle of the foot attached to the side of the lamellar tooth near to its termination; if it be thin, although of the same species, it will be found generally confluent or near to the great posterior muscle. The cicatrices, made by the attach-

* Herein described.

† See my description of new Uniones in this volume.

ment of the superior part of the mantle in ponderous shells, generally will be found on the under part of the cardinal tooth. Sometimes six or eight may be found; and their direction is towards the lamellar tooth. In thin shells these cicatrices will be found in the cavity of the beaks, generally traversing it in an oblique direction*.

Ligament. This part of the shell must be viewed with the same doubt as the above character. In the same species the ligament may be long and narrow if the specimen be elongated and thin; and it may be short and thick if it be ponderous and obtuse. Thus we may find in an elongated *siliquoideus* the ligament an inch and a quarter long, and only one-tenth of an inch broad, while in an obtuse and ponderous specimen it may be found to be only three quarters of an inch long and yet one-eighth of an inch broad, as is the case in some specimens of my cabinet.

It has been a desideratum with the American conchologists to fix the nomenclature of this interesting genus, particularly so far as relates to our own species. In the hope of contributing in some measure to so desirable an object, I have carefully examined all that has been published on the subject so far as I could procure the descriptions, and with diffidence give the results, hoping my views may not be found to be incorrect.

The first column contains the species, the nomenclature of which is now likely to be permanent and fixed. The second the species described by other writers, which are either the same or varieties, and consequently synonymes.

1. U. radiatus†,	Gmelin,	1. radiata,	Lam.
		2. virginiana,	Lam.
		3. radiatus,	Barnes.

* See my description of new Uniones in this volume.

† Lister (t. 152, f. 7.) gives a correct representation of the species known to American conchologists as *U. radiatus*, and which he says came from Virginia. Chemnitz (vol. vi. t. 2, f. 7.) gives a representation of a shell very similar to it, the locality of which is Malabar. The first name we find for it is in Gmelin, *Mya radiata*, and this author refers to both figures in his description. Dillwyn re-

2. U. complanatus†, Soland. MSS.	purpureus,	Say.
	rarisulcata,	Lam.
	coarctata,	Lam.
	purpurascens,	Lam.
	rhombula,	Lam. var. *b.*
	carinifera,	Lam.
	georgina*,	Lam.
	sulcidens,	Lam.
	caroliniana,	Bosc.
	fluviatilis,	Green.

fers to each of the above authorities, but thinks Lister's figure is too doubtful to be retained, as Solander had referred to it for a variety of *Mytilus modiolus*, in which, however, he errs, for Lister's figure is a good representation of a small specimen of the *radiatus* of our waters. Lamarck, in his description of "*U. radiata*," refers to Lister and Gmelin, and also to the figure of Mr Say's *ochraceus*. The last is a distinct species. Several of these writers refer also to the figure in the Ency. Meth. t. 248, f. 5, which is evidently copied from Chemnitz. Mr Barnes, in his description, refers to Say's *U. ochraceus*, Dillwyn's *Mya radiata*, and Lamarck's *U. radiata*. Considerable difficulty presents itself in establishing the name of this species, so well known among us by that of *U. radiatus*, in consequence of the old writers using the same name for those from Virginia and Malabar, which, I believe, when examined together, will be found specifically to differ. Should this prove to be the fact, we must give to our shell the name which Lamarck has described it under a second time, viz. "*U. virginiana*," giving it a masculine termination.

* It should be mentioned here that I was not aware that Mr Barnes had pronounced the first six to be varieties of Say's *purpureus* until after I had selected the seven.

† The celebrated *Lister* published his great work on conchology in 1685, and at that early period he was in possession of several species of our fluviatile shells procured from Virginia. The first he thus describes, "musculus brevior, admodum crassus, ex interna parte subroseus, cardine incisuris minutis exasperato," t. 150, f. 5. Dillwyn describes this shell under the name of *Mya complanata*, and refers to this figure. Beside the locality above, Solander gives Maryland and New Jersey, and Humphreys Mississippi. The latter is most likely an error. Dr Green supposed this shell, so well known to all our conchologists under Mr Say's name *purpureus*, to be the *Mytilus fluviatilis* described by Dillwyn from Gmelin, and referred to Lister, t. 157, f. 12. I differ, however, in this opinion, 1. Because it is not described as being toothed. 2. Gmelin says, "habitat in Europæ aquis dulcibus." 3. The *complanata* answering, in description, better to our shell, and being the first figured and described. It appears somewhat singular to me, that the observant and able zoologist, Mr Say, had not been struck with the similitude of our shell to Lister's figure and description. There is no species more common in all our fresh waters, east of the Alleghany mountains, than this, and nothing could be more likely than that it should be among the first to be taken to Europe by the early voyagers to North America. In accordance,

3. U. ovatus,	Say*,	ovata,	Lam.
		ovata,	Valenciennes.
4. U. cariosus,	Say†,	luteola,	Lam.
		cariosa,	Lam.
		crassus (old)‡,	Say.
		carinatus (rayed),	Bar.
		ellipticus (young),	Bar.
5. U. nasutus,	Say,	rostrata,	Valen.
6. U. cylindricus,	Say,	naviformis,	Lam.
		naviformis,	Valen.
7. U. subtentus,	Say.		
8. U. plicatus,	Le Sueur§,	crassidens?	Lam.
		peruvianus,	Lam.
		rariplicata,	Lam.
		undulatus,	Bar.
		crassus,	Bar.
		undulata,	Valen.
		dombeyana,	Valen.

therefore, with the rules of nomenclature, I have inserted the name of *complanatus* to the shell described by Mr Say under the name of *purpureus*.

* Dr Hildreth, in describing this species of Say, says, "I think it a near relation of the *gracilis*;" and, when describing the *gracilis*, he says, "The contour of the shell, independent of the wing, is much like that of the *alatus*." In the latter he is right, but in the former remark altogether wrong.

Donovan, Dillwyn, Maton and Racket, and some other British writers have made use of this name for a Unio resembling the *pictorum*. I have thought it better, however, to retain Mr Say's name for his species, which is totally different, being satisfied that the British shell is only a variety of *pictorum*.

† This is probably the only species yet known to be common both to the Western and Atlantic waters.

‡ *Crassus* is omitted in this catalogue, believing that several other species, and those only because they were ponderous, have been described under this name. Mr Say's *crassus* (See Am. Conch. plate 1, fig. 8,) is evidently an old and ponderous *cariosus*, and he considered the "*plicatus*" as a variety. Mr Barnes's *crassus* is an old and thick *peruvianus*, as is most likely Lamarck's *crassidens*. The *giganteus* of Dr Mitchill's collection is also a *peruvianus*, which occurs in some of our western waters of a larger size and more ponderous than any species we know of.

§ This species was first described by Say in the American Conchology as a va-

9. U. rectus,	Lam.*	prælongus,	Bar.
		nasuta,	Lam.
		purpurata ?	Lam.
		recta,	Valen.
10. U. torsus†,	Rafinesque.		
11. U. mytiloides,	Rafin.	undatus,	Bar.
12. U. metanever,	Rafin.	nodosus,	Bar.
		rugosus (flat),	Bar.
13. U. scalenius,	Rafin.		
14. U. cornutus,	Bar.‡		

riety of *crassus*. At the same time he mentioned that its discoverer, that excellent naturalist Mr Le Sueur, suspected it to be a new species, and proposed, should this prove to be the case, to call it "*plicata*." We are, therefore, bound to adopt his name on the claim of priority; and a more descriptive one could not be given to it.

* When Dr Hildreth described the "*prælongus*," it is evident he believed it to be *prælongus* of Barnes, for he uses Barnes's name without stating it to differ from his, although the descriptions are not exactly the same. Barnes says, "Naker, *purple* of different shades," and "deep and splendid purple." (See Barnes's Reclamation.) Hildreth says, "Naker, *white*, and tinged with spots of green."

The specimen of "*recta*," described by Lamarck, was "white," according to his description. I have seen very many specimens of this species, some of which are tinted with light purple or salmon about the cavity of the beaks and cardinal tooth; they are generally, however, of a pure white. The explanation of these contradictory characters is this: The specimen in the collection of the New York Lyceum, and the same is said of one in Dr Mitchill's collection, both brought from the upper lakes, is unusually full of colour, having almost the whole of the nacre of a rose or delicate purple. It has more colour than any specimen I have seen.

† M. Rafinesque is entitled to a preference in this beautiful and extraordinary species, possessing the most elevated recurved beaks of the whole genus. It was generally known among us by the name of *U. orbicularis*, but not described. The variety, not emarginate, can not be made a species, as the two pass into each other. Dr Hildreth has recently described a shell, which I believe to be the *torsus*, in Silliman's Journal under the name of *U. orbiculatus*. He says, "This shell is a variety of the *crassus*." Whose *crassus?* Mr Say's, as mentioned before, is a ponderous *cariosus;* Mr Barnes's, a *peruvianus;* and, if a *variety* of *crassus*, why call it *orbiculatus?*

‡ This species is among the most interesting of the genus. It presents a much greater variety than any other, and might be called a real *proteus*. The true

15. U. verrucosus,	Bar.	{ verrucosa,	Valen.
		{ tuberculosa,	Valen.
16. U. tuberculatus,	Bar.		
17. U. gibbosus,	Bar.	mucronatus,	Bar.
18. U. cuneatus*,	Bar.		
19. U. ventricosus†,	Bar.		
20. U. siliquoideus,	Bar.	inflatus,	Bar.
21. U. triangularis,	Bar.		

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cornutus has three or four distinct "horns," and the varieties gradually increase in the number, and vary in the forms of those elevations until they are lost in two ridges passing from the beaks to the posterior basal margin. It is exceedingly interesting to trace these gradual changes of form; and to illustrate the fact of the anomalous varieties being of the same species, I have arranged forty-three specimens in my cabinet, no two of which are alike. Dr Hildreth has made a species of one of these varieties, and calls it *foliatus*. It appears that Mr Barnes and himself had seen only this specimen. I have had three or four in my possession for three years, and at first my impression was in favour of their being new, but examining them with that excellent conchologist, Mr Stewart, we found the line of impression, made by the mantle, did not run parallel with the deep arcuation of the margin, and therefore concluded, at once, that the animal could not conform to the shape of the shell, and consequently that the elongations of the basal and posterior margins were unnatural. Dr H. says he is "unable to determine whether it is a new variety, or only a "lusus naturæ;" and yet he makes a new species of it!! Some of my varieties have the prolongation much more extended than the specimen described by Dr H. In one specimen the unnatural prolongation is more than equal in extent to the natural size of the shell, designated by the impression of the mantle.

* We have been much in the habit of confounding this with the *complanatus*, and considering it as the analogue inhabiting the western waters. It deserves, however, to be retained by Barnes's name, for it possesses characters which the other does not. It is posteriorly more angular, and the shell is subtriangular; the *complanatus* is sub-rhomboidal and more carinate. One inhabits the western; the other the Atlantic rivers. The *cuneatus* is always ponderous; the *complanatus*, I believe, never. Mr B. says his species is never rayed; in this he is mistaken, young and fine specimens have dark broad rays.

† This is undoubtedly the species which we have known under the name of *globosus* (undescribed). Mr B. says "it is more capacious than any of the genus hitherto described." It resembles the *ovatus*, but is always more globose.

22. U. parvus*, Bar.

23. U. æsopus, Green.

24. U. calceolus†, Lea.

25. U. lanceolatus, Lea.

26. U. donaciformis, Lea.

27. U. ellipsis, Lea.

28. U. irroratus, Lea.

29. U. lacrymosus, Lea.

30. U. ater, Lea.

31. U. rubiginosus, Lea.

32. U. heterodon, Lea.

33. U. sulcatus, Lea.

34. U. planulatus, Lea.

35. U. circulus, Lea.

36. U. multiradiatus, Lea.

37. U. occidens, Lea.

38. U. securis, Lea.

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* This is rather the smallest species with which I am acquainted. Barnes says it is "the smallest and most beautiful of all the genus yet discovered in America." In this he alludes to the nacre only, which is more pearly and more brilliant than any species I have seen. The exterior presents nothing peculiar but its concentric waves on the beaks, and a slightly elevated rib passing from the beaks to the posterior margin.

† Although I had three specimens of this shell in my possession when I described it, I felt apprehensive it was too closely allied to the Alasmodonta of Say to be considered as an Unio; but as a lamellar plate really existed with an incipient tooth, though small, on each valve, besides the large cardinal tooth, I determined it to be the safest plan to class it with the Uniones. I have recently received larger specimens in which this plate almost entirely disappears, while in younger specimens it is more evident.

39. U. iris, Lea.

40. U. zig-zag, Lea.

41. U. patulus, Lea.

Conchologists have with great reason complained of the extreme difficulty of identifying Lamarck's species of the genus Unio. Mr Barnes says, "In most cases wherever M. Lamarck can find a difference, though by his own account '*nothing remarkable*,' he makes a different species;" and Mr Swainson declares that "one half the species which he has enumerated" cannot be determined on account of the short descriptions and want of figures. The truth of these remarks I have felt severely whenever I have had occasion to consult this author for the genus; and, with the hope of clearing the path in a measure of those who may follow me, I propose to give here the results of examinations of his species made at different times with much care.

U. sinuata. This is the *Mya margaritifera* of Linnæus and other authors, and to which Barnes's *Alasmodonta arcuata* is the analogue. Mr B. was not aware, when he described it, that it was similar. He has recently, in the reclamation of his Uniones, resigned this species of Alasmodonta. If Mr Say's genus be admitted, we must of course call this type of Lamarck's Unio, *Alasmodonta margaritifera.*

U. elongata. There can scarcely be a doubt but that this is a young shell of the above species.

U. crassidens. It is evident on examination of our author's description of this species and its varieties, and the *crassus* of Say and of Barnes, that all the *ponderous* varieties of our Uniones were brought into these species, neither of which can possibly stand. (See note, page 417.)

U. peruviana. This species embraces the *plicata* of Le Sueur, the *crassus* and *undulatus* of Barnes, the *giganteus* of Dr Mitchill's collection, the *rariplicata* and *crassidens* of Lamarck, and the *undulata* and *dombeyana* of Valenciennes.

As it was described previously by Le Sueur's name "*plicata*," this must take precedence. Its habitat, Peru, I think very doubtful; it most probably came from the United States.

U. rariplicata. This is, no doubt, a variety of the above.

U. purpurata. The *recta* answers to this description in every respect but the habitat. The author "believes" it came from Africa. The shell most probably came from the United States, in which case there could not be a doubt.

U. ligamentina,
U. obliqua,
U. retusa.

The description of these is so imperfect that I cannot identify either of them, although they are all from this country, and the same species most probably in our cabinets. I doubt if either of them should be retained.

U. rarisulcata,
U. coarctata,
U. purpurascens.

These are mere varieties of the *complanatus.*

U. radiata. Our author gives the *Mya radiata* of Gmelin and *U. ochraceus* of Say as synonymes to this species. It cannot be both; for the *ochraceus* is a perfectly distinct species from the *M. radiata*, which, Chemnitz says, comes from the rivers of Malabar. The *radiatus* described by Barnes after Lamarck, and Say's *ochraceus* are distinct species, and I have no doubt the *Mya radiata* of Gmelin is distinct from both. Mr Say's figure, referred to by Mr Barnes (pl. 2, fig. 8, Am. Conch.) as *U. radiata*, is undoubtedly an *ochraceus*. (See note on *U. radiatus.*)

U. brevialis. This shell is pictured by Crouch; it is thick, and resembles the *circulus* of the Ohio, but is larger, less round and radiated. It comes from the Isle of France, and is, no doubt, a distinct species.

U. rhombula,
U. carinifera,
U. georgina,

Are all mere varieties of the *complanatus.*

U. clava. I cannot identify this species. The description is too short. Its habitat is Lake Erie and Nova Sco-

tia, from which circumstance it is most probably in our cabinets under another name.

U. recta. This is the same with Barnes's *prælongus.* The *recta* being described first should be retained.

U. naviformis. This name cannot be retained, as Say had previously described the shell under the name of *cylindricus.*

U. glabrata. The habitat of this species is the Ohio river. The description is too imperfect to identify it, and as the author acknowledges it has "nothing remarkable," we may fairly conclude it to be a variety of some one of the numerous species described, a *cariosus* most probably.

U. nasuta. The author thinks this may be the *nasutus* of Say, but the description answers much better to his own *recta* or Barnes's *gibbosus,* and is no doubt one of those. I do not believe the *nasutus* has ever been found in our western waters*.

U. ovata is the *ovatus* of Say, and inhabits the western waters, not the Susquehanna and Mohawk, as mentioned by Lamarck. Maton and Rackett described a British shell under this name, which I believe to be only a variety of *pictorum.* Those sent me from England by this name were certainly mere varieties of the *pictorum.*

U. rotundata. In most of our cabinets may be found a beautiful shell, which we have thought to be of this species, and have adopted the name. It does not, however, answer to the description in some essential characters, and I have therefore thought proper to describe the American shell, and give it a new name. (See description of *circulus.*) Lamarck gives no habitat. Ours is from the Ohio.

U. littoralis is from the Seine, and is described by Draparnaud, who says it resembles the "*U. margaritifera,*" but is much smaller.

U. semirugata. Description too short to identify it. Has no habitat.

* Swainson says, "The *Unio nasuta,* however, of Lamarck, I apprehend, will be found different" from *Unio nasutus* of Say.—*Zool. Illus. Vol. I. pl.* 57.

U. nana. This species is said to inhabit Franche Comté. I do not know if there be a specimen in this country.

U. alata is the well known *alatus* of Say, and is herein made the type of a new genus, *Symphynota.*

U. delodonta. Description too short to identify it. Has no habitat.

U. sulcidens. A variety of *complanatus;* and is from the Schuylkill, Pennsylvania.

U. rostrata. The specimens which I received from Europe with this name are only elongated varieties of *pictorum.*

U. pictorum. This is a well known species, and described by Linnæus and others as *Mya pictorum.*

U. batava. The specimens sent me of this species from Europe appear to be only a variety of the *pictorum.* It is more obtuse*.

U. corrugata. This species can not be identified with any of ours. It comes from the coast of Coromandel, and is, doubtless, a distinct and well characterised species.

U. nodulosa. The habitat of this species is Lake Champlain, and although pictured in the Ency. Meth. I cannot identify it, the drawing being evidently incorrect. Although represented with a lamellar tooth, I should not be surprized if it proved to be a young *Alasmodonta undulata* of Say, as it has the strong character on the beaks.

U. varicosa. I can only assimilate this with the *Alasmodonta undulata* of Say. Its habitat is the Schuylkill and Lake Champlain.

U. granosa. This is a beautiful and distinct species. Habitat Guyana.

U. depressa. Habitat New Holland. The description is very imperfect, but the species nevertheless distinct. It is a very different shell from that called *depressa* by Rafinesque, who does not seem to have known that the name was preoccupied by Lamarck.

* The *U. anas* I believe to be a variety of *pictorum* very similar to this. My specimen is certainly such. The *U. tumida*, from the north of Europe, appears to me to be only a large and thick *pictorum.*

U. virginiana. This, doubtless, is the *radiatus* described by Barnes. Habitat Virginia.

U. luteola is a variety of Say's *cariosus.* Habitat Susquehanna and Mohawk.

U. marginalis. I have specimens of this species from Bengal. It is well characterised, although it does not always possess the marginal character as described by Lamarck and represented in the Ency. Meth. pl. 247.

U. angusta. This I believe to be a variety of *pictorum.* The figure referred to in Lister is certainly a *pictorum,* and is generally quoted as such. Habitat unknown.

U. manca. This may be a distinct species, but I strongly suspect it to be only a variety of *pictorum.* Habitat Bourgogne.

U. cariosa is the *cariosus* of Say.

U. spuria. I cannot identify this species with any of ours. Habitat . . . . .

U. australis. This, like the above, is not identified. Habitat New Holland.

U. anodontina. Habitat Virginia. We have no Unio of this description in our waters. It is probably *Anodonta undulata* of Say, which has sometimes small elevations somewhat similar to teeth*.

U. suborbiculata. I cannot identify this species.

In passing criticisms upon the species of the genus Unio of this great naturalist, I do not in the least wish to detract from his great and merited fame. My object is expressly to endeavour to facilitate the study of this interesting genus, and to remove, as far as I have it in my power, the confusion which has crept into it. My observations I wish to pass only for what they may prove to be worth.

* Since writing the above, I observe that Sowerby on the Lamarckian *Naïades* (Zoolog. Journ. Vol. I. p. 54.) gives the "*Anodon rugosus*" of Swainson as the synonyme of *U. anodontina.* It is well known to our conchologists that Swainson's *rugosus* is the old shell of Say's *Anodonta undulata,* which was described from a young specimen, and has priority to the *rugosus.*

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1. Unio Ater. Plate VII. fig. 9.

Testâ ovatâ, inæquilaterali, transversâ, ventricosissimâ; umbonibus elevatis; natibus prominulis; epidermide rugosâ nigrâque; umbonibus elevatis; dentibus cardinalibus erectis, cristatis, lateralibus granulatis, rectisque; margaritâ roseâ.

Shell inequilateral, ovate, transverse, much inflated; umbones elevated; beaks slightly prominent; epidermis black and wrinkled; cardinal teeth erect and crestlike, lateral granulated and straight; nacre rose colour.

Hab. Mississippi below Natchez. T. W. Robeson.
My Cabinet.
Cabinet of Prof. Vanuxem.

Diam. 2·6, Length 3, Breadth 4·5 inches.

Shell very ventricose; margin ovate, wider behind, slightly emarginate at base, and sometimes slightly truncate at posterior margin; substance of the shell thick; beaks slightly projecting and decorticated; ligament large; epidermis black or blackish, and wrinkled transversely; cardinal teeth erect, crestlike, and double in both valves; lateral tooth curved, long, deeply divided and slightly serrate, the interior division emerging from the cavity of the beak; posterior cicatrices confluent, anterior cicatrices very distinct; dorsal cicatrices pass across the cavity of the beaks in a row*; cavity of the shell great; nacre pink and iridescent in the posterior margin.

Remarks.—This shell is remarkable for the colour of its epidermis and nacre. The perpendicular distance from the cardinal tooth to the basal margin is very small, while that from the posterior end of the lamellar tooth to the same margin is unusually great. It slightly approaches in form to some varieties of the *cariosus*.

* In a former paper of this volume, (page 262) I described the attaching muscles of the back of the animal, the impressions of which in the shell I propose to call *dorsal cicatrices*.

2. Unio Rubiginosus. Plate VIII. fig. 10.

Testâ inæquilaterali, transversâ, postice sub-biangulari, antice rotundatâ; valvulis sub-crassis; natibus prominentibus, recurvis, postice sub-angulatis; dente cardinali magno, laterali crasso; margaritâ salmonis colore.

Shell inequilateral, transverse, sub-biangular behind and rounded before; valves somewhat thick; beaks prominent, recurved, sub-angulated behind; cardinal tooth large; lateral tooth thick; nacre salmon coloured.

Hab. Ohio.

My Cabinet.
Cabinet of T. G. Lea.
Cabinet of Prof. Vanuxem.
Cabinet of the Academy of Natural Sciences.

Diam. 1·2, Length 2·1, Breadth 2·6 inches.

Shell somewhat ventricose; substance of the shell somewhat thick; umbones slightly elevated; beaks recurved, seldom decorticated, almost touching, whitish, possessing several concentric undulations, which are lost along the umbonial slope, which is carinate; a small curved elevated line passes from the point of the beaks to the margin above the posterior margin; ligament rather large passing from the points of the beaks; dorsal margin oblique; posterior dorsal margin carinate and slightly emarginate; posterior margin angular; posterior basal margin very slightly curved; basal, anterior and anterior dorsal and basal margins rounded; epidermis colour of rust, sometimes salmon yellow, slightly wrinkled and showing the marks of growth; rays in young specimens perceptible; cardinal tooth sulcate, broad and not elevated, often single in both valves; the tooth in the left valve closing in a cavity which sinks almost into the cavity of the beaks of the right valve; lateral teeth rather thick, elevated, straight, generally double in both valves; in the left valve the upper division is less elevated and shorter; anterior and posterior cicatrices both distinct; the smaller posterior cicatrix is situ-

ated against the side of the lamellar tooth, near its termination; the anterior adductor muscle makes a cicatrix also against the end of the cardinal tooth; dorsal cicatrices under the cardinal tooth perceptible; cavity of the beaks deep and rounded; nacre always more or less salmon colour; slightly iridescent at posterior margin; whitish on the margin near the adductor muscles.

Remarks.—This is a very distinct species. In its general form it approaches nearest to the *securis*, which, however, is always white in the nacre, and peculiarly rayed. It is peculiar in its reddish brown epidermis, which colour is caused by the salmon nacre showing through it. The character of the cardinal tooth is very peculiar, having a tendency to be single in both valves, while the lamellar tooth is quite equally disposed to be double. All the specimens which I have seen are salmon colour in the nacre. If this should prove universally so, it is the only species which we know to be constantly of that colour.

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3. Unio Heterodon. Plate VIII. fig. 11.

Testâ rhomboido-ovatâ, inæquilaterali, ventricosâ; valvulis tenuibus; dentibus cardinalibus compressis, latis; dentibus lateralibus sub-curvatis, dente laterali valvulæ dextræ, duplici; natibus prominentibus; ligamento sub-brevi; margaritâ albâ.

Shell rhomboidal-ovate, inequilateral, ventricose; valves thin; cardinal teeth compressed, wide; lateral teeth slightly curved, the *double tooth in the right valve*; beaks prominent; ligament rather short; nacre white.

Hab. Schuylkill and Derby Creek, Pa.
My Cabinet.
Cabinet of Mr Mason.
Cabinet of Prof. Vanuxem.
Cabinet of Dr Griffith.

Cabinet of the Academy of Natural Sciences.
Cabinet of Mr Hyde.
Cabinet of Mr Phillips.
Cabinet of Mr Conrad.

Diam. ·5, Length ·9, Breadth 1·5 inches.

Shell rhomboidal-ovate, inequilateral, ventricose; substance of the shell thin; beaks prominent, subcarinate posteriorly, eroded, undulated; ligament rather short; epidermis greenish brown, with oblique obscure rays, wrinkled; dorsal margin rectilinear; posterior dorsal margin obtusely angular; posterior margin acutely angular; basal margin slightly curved; anterior, anterior basal and dorsal margins rounded; cardinal tooth in left valve compressed, wide, reaching beyond the cavity of the beaks, double cleft; in right valve one elevated recurved tooth, which clasps the side of the opposing one; lateral tooth curved, short in left valve, and long in the right, *in which it is double;* anterior cicatrices confluent, as are also the posterior; dorsal cicatrices situated on the under part of the cardinal tooth, scarcely perceptible; cavity of the beaks large; nacre white.

Remarks.—This remarkable species was first observed by Mr Mason and Mr Hyde. To the kindness of the former I am indebted for the use of the fine large specimen figured. It is very curious in the whole apparatus of the hinge, the teeth of which resemble in some measure the *Symphynota compressa*, herein described. From the anterior end of the cardinal tooth to the posterior end of the lateral, the distance is the same in both valves, but in the left valve the cardinal tooth is longest, while in the right valve the lateral tooth is longest. The peculiar character of this shell is in the *double* lateral tooth being in the right valve, in which it differs from all the species yet described. It most resembles in general form the *Alasmodonta** *marginata* of

* Mr Say published his description of the genus *Alasmodonta* in the Journal of the Academy of Natural Sciences of Philadelphia, 1818, without knowing, it is to

Say; and some of the younger and more ventricose specimens assume the appearance of the *U. triangularis.*

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4. Unio Sulcatus. Plate VIII. fig. 12.

Testâ sub-ellipticâ, inæquilaterali, ventricosâ, sub-emarginatâ; valvulis crassis; natibus fere terminalibus; dentibus cardinalibus lateralibusque magnis, et duplicibus in valvulis ambabus; margaritâ purpureâ.

Shell sub-elliptical, inequilateral, ventricose, slightly emarginate; valves thick; beaks nearly terminal; cardinal and lateral teeth large, and double in both valves; nacre purple.

Hab. Ohio. T. G. Lea.
My Cabinet.
Cabinet of T. G. Lea.
Cabinet of Prof. Vanuxem.
Cabinet of P. H. Nicklin.
Cabinet of the Academy of Natural Sciences.

Diam. 1·3, Length 1·7. Breadth 2·3 inches.

Shell very thick, ventricose, inequilateral, obliquely longitudinal; margin sub-elliptical, with an emargination of posterior basal margin, caused by a broad furrow running from the beaks to this part of the margin; substance of the shell thick and ponderous; beaks thick and projecting beyond the margin, nearly terminal, decorticated; ligament partly concealed by the beaks; epidermis olive-brown, wrinkled, with numerous fine hair like lines, which are slightly undulated, passing from the beaks to the margin; these lines are obsolete in the anterior part of the shell, and crowded in the furrow, over the umbonial slope they are proximate; cardinal tooth elevated, conico-triangular, that in left valve deeply divided; lateral tooth long, thick, and slightly curved, direction nearly

be presumed, that the *Mya margaritifera* of Linnæus was in 1817 erected into a new genus by Schumacher, under the name of *Margaritana.* If the absence of the lateral tooth be sufficient to establish the genus, we must necessarily call it by the Danish naturalist's name.

same as cardinal tooth; posterior cicatrices distinct, the smaller one being placed immediately over the large one, and against the lateral tooth; anterior cicatrices distinct; dorsal cicatrices situated on the under part of the cardinal tooth, very perceptible; cavity of the beaks small; nacre flesh-red, varying from this to nearly white; iridescent in the posterior margin.

Remarks.—This is variety *a* of *U. ellipsis*, described in a former paper, and approaches it closely. Having seen several specimens since that description was made, my doubts have been satisfied, and I now consider it a new species. It differs from the *ellipsis* in having the furrow, in being generally covered with fine hair-like rays, and in being always more or less flesh-red inside. I have two specimens of this species which present a singular formation of the posterior basal margin, which is dentate, the points interlocking and almost hooked. The elevation anterior to the furrow commences to swell one-third of the distance from the margin to the beaks, increases as it approaches the margin, and assumes this dentation, which being successive as the shell increases displays laminæ of these dentations in the epidermis. In the interior this part of the shell has the appearance of having been gouged out. It is exceedingly curious, being the only specimen of fluviatile shells I have seen with a margin approaching to a dentate appearance.

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5. Unio Planulatus. Plate IX. fig. 13.

Testâ inæquilaterali, ovato-ellipticâ, transversâ; complanatâ per umbones à natibus usque ad marginem inferiorem, maculis quadratis radiatim pictâ; natibus prominulis; dente cardinali parvo, laterali magno, crasso, curvato; margaritâ sub-cœruleo-albâ.

Shell inequilateral, ovate-elliptical, transverse, flattened across the umbones from the beaks to the basal margin, marked with square spots in form of rays; valves thick; beaks slightly prominent; cardinal tooth small; lateral tooth large, thick and curved; nacre bluish white.

Hab. Ohio. T. G. Lea.
My Cabinet.
Cabinet of T. G. Lea.
Cabinet of Prof. Vanuxem.
Cabinet of P. H. Nicklin.
Cabinet of the Academy of Natural Sciences.

Diam. ·8, Length 1·3, Breadth 2·2 inches.

Shell ovate-elliptical, remarkably flattened over the umbones from the beak to the basal margin, which frequently causes the greatest diameter to be near to the anterior margin; substance of the shell thick; beaks slightly prominent and decorticated; ligament deeply seated, scarcely appearing above the margin of the shell; epidermis wrinkled, yellowish brown, with transversely interrupted rays passing from the beaks in a slight curve to the margin along the umbonial slope; these rays are hair like, undulated, and interrupted; cardinal teeth very small and lobed; lateral tooth remarkably thick and situated on a large massive plate; curve very slight and directed much over the cardinal tooth, somewhat rough, upper division smaller than the lower; anterior and posterior cicatrices both distinct; the smaller posterior cicatrix is situated against the end of the plate at the point of the division of the tooth; dorsal cicatrices situated on the under part of the cardinal tooth, perceptible; cavity of the shell very small and irregularly waved; an indistinct depressed line may always be seen to pass from the great posterior cicatrix along the base of the lateral tooth into the cavity of the beaks; nacre white.

Remarks.—This shell is peculiar in the massive plate on which is situated its short and thick lateral tooth, as well as in the very small size of its cardinal tooth. It has scarcely any cavity under the beaks, the shell being very thick. Its epidermal rays, in perfect specimens, are very unusual to this genus; in old specimens they are almost or quite obsolete. It is remarkable also in its flat umbones. It resembles most in form the *gibbosus* of Barnes, but is less rostrated and more

thick. The *gibbosus* is seldom if ever perfectly white; all the specimens I have seen of this are perfectly so.

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6. Unio Circulus. Plate IX. fig. 14.

Testâ circulari, ventricosâ, sub-æquilaterali; valvulis crassis; natibus prominulis; dentibus cardinalibus lateralibusque magnis; ligamento brevi crassoque; margaritâ albâ et iridescente.

Shell circular, ventricose, nearly equilateral; valves thick; beaks slightly elevated; cardinal and lateral teeth large; ligament, short and thick; nacre pearly white and iridescent.

Hab. { Ohio at Cincinnati. T. G. Lea.
Monongahela at Pittsburg. T. Bakewell.
Tennessee at Nashville. Prof. Vanuxem.
My Cabinet.
Cabinet of T. G. Lea.
Cabinet of Prof. Vanuxem.
Cabinet of P. H. Nicklin.
Cabinet of Dr Griffith.
Cabinet of W. Hyde.
Cabinet of W. Mason.
Cabinet of J. Phillips.
Cabinet of the Academy of Natural Sciences.
Cabinet of Peale's Museum.
&c.

Unio rotundata? Lamarck.

Diam. 1, Length 1·5, Breadth 1·5 inches.

Shell round; posterior basal margin sometimes very slightly emarginate, very ventricose, transversely wrinkled, nearly equilateral; substance of the shell thick; beaks elevated, medial, and somewhat recurved; epidermis finely wrinkled, shining, satin-like, anterior to the umbonial slope dark brown, posterior light yellow brown; cardinal teeth oblique, thick, and disposed to be treble in both valves; lateral teeth short and thick, disposed to be double in right valve as well as left;

Anterior cicatrices distinct; posterior cicatrices also distinct; the smaller one being placed against the termination of the lateral tooth; dorsal cicatrices situated on the under part of the cardinal tooth, very perceptible; cavity of the beaks deep and sub-angular; nacre white, pearly, and iridescent, rarely tinted with rose in the centre.

Remarks.—This beautiful little shell is generally an inch long, rarely two. It is common in our cabinets, and has been considered the "*rotundata*" of Lamarck. I am induced, however, to think it different from our shell, as the *circulus* never possesses the fold mentioned in that eminent conchologist's very short description. The two colours disposed in so peculiar a manner in the epidermis are not mentioned by him. It differs also greatly in size. I have seen some hundreds, the largest of which was two inches in breadth. The "*rotundata*" is 78 millimetres; and its habitat is unknown.

The margin of the *circulus* is more perfectly round than any other species; it is sometimes disposed to be subangular posteriorly. The division of the colour on the umbonial slope is very peculiar. When the posterior slope is looked on, this view of the shell is heart shaped, and the dark brown colour is seen entirely to surround the light yellow brown. The epidermis is more satin-like than any other species, and the teeth are peculiarly disposed to be double. In form it approaches the "*torsa*" more closely than any other species.

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7. Unio Multi-radiatus. Plate IX. fig. 15.

Testâ ellipticâ, inæquilaterali, ventricosâ, multi-radiatâ; valvulis tenuibus; natibus prominulis; dentibus cardinalibus erectis, et in valvulis ambabus duplicibus; lateralibus lamelliformibus et abruptis; margaritâ cæruleo-albâ.

Shell elliptical, inequilateral, ventricose, much rayed; valves thin; beaks rather prominent; cardinal teeth erect and double in both valves; lateral teeth lamelliform and abrupt; nacre bluish white.

Hab. Ohio. T. G. Lea.
My Cabinet.
Cabinet of T. G. Lea.
Cabinet of Prof. Vanuxem.

Diam. ·8, Length 1.3, Breadth 2 inches.

Shell elliptical, inequilateral, ventricose; substance of the shell thin, the rays being very visible through the nacre; beaks prominent and slightly undulated; epidermis bright olive yellow, with numerous green rays passing from the beaks to every part of the margin; slightly wrinkled, smooth and glossy; cardinal tooth double in both valves and deeply cleft; lateral tooth lamelliform, nearly straight, higher near the termination, termination abrupt; anterior cicatrices distinct; posterior cicatrices confluent; dorsal cicatrices situated on the under part of the cardinal tooth, and within the margin of the cavity of the beaks; cavity of the beaks large and rounded; nacre pearly white and iridescent, thin, showing the rays very distinctly through it, and presenting a wide margin.

Remarks.—This beautiful shell resembles most the young *cariosus* of the Ohio and other western waters. It differs, however, in being much less ponderous, possessing more minute rays, being rather more ventricose, having more elevated teeth and more prominent beaks.

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8. Unio Occidens. Plate X. fig. 16.

Testâ sub-ellipticâ, inæquilaterali, transversâ, ventricosâ; valvulis crassis; natibus sub-undulatis, raro decorticatis; ligamento sub-brevi crassoque; dentibus elevatis; margaritâ albâ.

Shell inequilateral, sub-elliptical, transverse, ventricose; valves thick; beaks slightly undulated, rarely decorticated; ligament rather short and thick; teeth elevated; nacre white.

Hab. Ohio. T. G. Lea.
My Cabinet.

Cabinet of T. G. Lea.
Cabinet of Prof. Vanuxem.
Cabinet of P. H. Nicklin.
Cabinet of the Academy of Natural Sciences.
Cabinet of Peale's Museum.

Diam. 1·6, Length 2·3, Breadth 3·4 inches.

Shell ovate, inequilateral, sub-elliptical, transverse, very ventricose; substance of the shell somewhat thick; beaks large, prominent, rounded, approaching, slightly undulated, rarely decorticated; ligament short and thick; epidermis slightly wrinkled, shining, olive yellow, with green rays passing obliquely from the beaks to the margin, most numerous on the posterior slope; cardinal teeth double and very prominent in both valves; in the left valve the cleft is deep and both prongs rake much, the outer most elevated; in the right valve the cleft is also deep, and the inner prong is broad, flat, curved, and most elevated; lateral teeth short and very lamelliform, the termination declining rather suddenly; anterior cicatrices generally distinct; posterior cicatrices confluent; dorsal cicatrices very perceptible, the line commencing with quite a large one on the under side of the callus between the lateral and cardinal teeth, and terminating at the outer part of the base of the cardinal tooth; marginal cicatrix very perceptible; cavity of the beaks deep, large and rounded; nacre milk white, rarely iridescent.

Remarks.—The specimen figured is the finest I have ever seen of this species, and, taking it altogether, perhaps of any other of the genus. The rays are very remarkably fine, and the nacre is purer and whiter than the finest porcelain. It is very frequently, however, found with few or no rays, and the nacre, though milk-white and pure generally, is not always so. The double, deeply cleft, cardinal tooth of both valves, and the raking position of that of the left valve are peculiar to the species possessing this general form, which includes the *ovatus* and *ventricosus*. It seems to form the link between these two. It differs from the *ovatus* in not possessing the flat

posterior slope, and from the *ventricosus* in not being globose over the umbones; and of course is much less in diameter. The quite large impression of the mantle under the callus, between the lateral and cardinal teeth, is very remarkable in these three species.

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9. Unio Securis. Plate XI. fig. 17.

Testâ subtriangulari, inæquilaterali, per umbones valde complanatâ; valvulis crassis; natibus elevatis, recurvatis, compressissimisque; dente cardinali magno, laterali crasso; ligamento breviusculo, crassoque; margaritâ albâ et iridescente.

Shell sub-triangular, inequilateral, flattened over the umbones; valves thick; beaks elevated, recurved, much compressed; cardinal tooth large; lateral tooth thick; ligament rather short and thick; nacre pearly white and iridescent.

Hab. Ohio. T. G. Lea.
My Cabinet.
Cabinet of T. G. Lea.
Cabinet of Prof. Vanuxem.
Cabinet of the Academy of Natural Sciences.
Unio depressa of Rafinesque.

Diam. ·9, Length 1·5, Breadth 1·9 inches.

Shell sub-triangular, transversely wrinkled, inequilateral, much flattened over the umbones; substance of the shell thick, often ponderous; beaks elevated, much compressed, recurved; dorsal margin angular; posterior dorsal margin oblique; posterior margin angular; basal and posterior basal margin curved; anterior and anterior basal and dorsal margins round; posterior slope flattened, this view presents the shell as a long ellipsis; epidermis olive-yellow passing into olive-brown, shining and transversely wrinkled; rays formed by small spots, alternately darker and lighter than the general colour of the epidermis, which cause the rays to look like a minute chain, these rays are from one to two eighths of an inch apart, and extend over the whole disk, the spaces be-

tween are supplied with numerous hair-like lines, the whole passing in a curve from the beak to the margin; cardinal tooth large, irregularly cleft and sulcated; lateral tooth rather short and thick, in the right valve disposed to be double; anterior cicatrices distinct; posterior cicatrices also distinct, the small one being placed against the termination of the lateral tooth; dorsal cicatrices situated on the under side of the cardinal tooth; cavity of the beaks shallow and rounded; cavity of the disk small; nacre pearly white and iridescent.

Remarks.—Mr Rafinesque first observed this singular and interesting species. He found a single specimen near Evamville, Indiana, and described it under the name of *U. depressa*, which name being preoccupied by Lamarck, I have considered it incumbent on me to give it a new name. Many specimens have come under my inspection, and the shell being a very remarkable one, I am induced, in consequence of Mr Rafinesque's short description and imperfect figure, to give a more full description and a correct figure. It is altogether peculiar in its rays and its very compressed beaks; no species is so flat over the umbones, and no other species presents, when the posterior slope is held towards the observer, a long ellipsis, the widest part of which is about the centre. In consequence of the beaks being so very much compressed, the junior, when not more than an inch long, is *exceedingly* flat, and the cavity proportionally small. When the shell increases beyond this it seems to become suddenly thick, and its form becomes more rounded towards the margins, consequently the adult is very different in form from the junior, which might easily be mistaken for another species. It is more generally gaping at the anterior margin than the other species. It assimilates closely to the *planulatus* (described in this paper), but differs in the rays, the much compressed beaks, and being more hatchet shape. In the last character it resembles somewhat the *rubiginosus* described in this paper. It sometimes occurs twice the size of the one represented here.

10. Unio Iris. Plate XI. fig. 18.

Testâ angusto-elliptică, inæquilaterali, sub-ventricosâ; valvulis tenuibus; natibus prominulis; dente cardinali in valvulâ sinistrâ, duplici, in dextrâ sub-bifido, parvo, erecto; dentibus lateralibus longis tenuibusque; margaritâ sub-cœruleo-albâ.

Shell narrow-elliptical, inequilateral, slightly ventricose; valves thin, beaks slightly prominent; cardinal teeth double in the left valve, subbifid in the right, small, erect; lateral teeth long and thin; nacre bluish white.

Hab. Ohio. T. G. Lea.
My Cabinet.
Cabinet of T. G. Lea.
Cabinet of Prof. Vanuxem.

Diam. ·5, Length ·8, Breadth 1·6 inches.

Shell long-elliptical, inequilateral, slightly ventricose; substance of the shell thin, showing the rays through it, rather more dense before than behind; beaks slightly prominent, approaching, crowned with double concentric undulations when they are not decorticated; ligament rather long and thin; epidermis yellowish green, transversely wrinkled, marked with many oblique diverging rays passing from the beaks to the margin; cardinal teeth double in both valves, small, erect, and sharp; lateral teeth long, bladed, slightly curved and situated on the edge of the margin in contact with the ligament; anterior cicatrices distinct; posterior cicatrices confluent and scarcely perceptible; dorsal cicatrices within the cavity of the beaks, the largest on the under part of the callus; nacre very thin, milk white anteriorly, bluish white and iridescent posteriorly.

Remarks.—This species most resembles the *calceolus*. It differs, however, entirely in the teeth, which are distinct and well defined. The *calceolus* approaches closely to the genus *Alasmodonta* of Say. This is less ventricose and possesses more rays.

11. Unio Zig-zag. Plate XII. fig. 19.

Testâ ovatâ, inæquilaterali, ventricosâ; valvulis sub-crassis; dentibus cardinalibus magnis, erectis; lateralibus curvatis; natibus prominulis; radiis ex lineis angulatis compositis; ligamento brevi crassoque; margaritâ albâ.

Shell ovate, inequilateral, ventricose; valves rather thick; cardinal teeth large, erect; lateral teeth curved; beaks rather prominent; rays composed of zig-zag lines; ligament short and thick; nacre pearly white.

Hab. Ohio. T. G. Lea.
My Cabinet.
Cabinet of T. G. Lea.
Cabinet of Prof. Vanuxem.
Cabinet of P. H. Nicklin.
Cabinet of the Academy of Natural Sciences.
Cabinet of Peale's Museum.

Diam. ·6, Length ·9, Breadth 1·5 inches.

Shell ovate, inequilateral, ventricose; substance of the shell thick; beaks rather prominent, subcarinate posteriorly, generally eroded; ligament short and thick; epidermis yellow in ground, but traversed by oblique green rays, which give it sometimes a dark hue; these rays pass from the beaks to the margin over the whole disk, and are formed by zig-zag lines, which in some specimens are joined so closely as to become confluent; on the posterior slope are irregular lines converging below the ligament; cardinal teeth large, deeply divided in the left valve; lateral teeth slightly curved; anterior cicatrices distinct, as are also the posterior, the smaller of which is placed against the side of the lateral tooth at its termination; dorsal cicatrices situated along the base of the cardinal tooth within the cavity of the beaks; cavity of the beaks shallow; nacre pearly white and iridescent.

Remarks.—This beautiful little shell is about the size of Barnes's *parvus*. It is however entirely distinct from it. It is much heavier, more ovate, and radiated; has no concentric undulations at the beaks like the *parvus*, which character Mr

Barnes does not mention, and is yellowish, not brownish. This and the *donaciformis* are all I know which possess the zig-zag markings, and they most resemble each other.

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12. Unio Patulus. Plate XII. fig. 20.

Testâ ovatâ, compressâ, cuneiformi, inæquilaterali, obliquâ, transversâ; umbonibus compressis; valvulis sub-crassis; natibus sub-terminalibus; dente cardinali parvo; laterali longo et sub-curvato; margaritâ albâ.

Shell ovate, compressed, wedge-shaped, inequilateral, oblique, transverse, compressed on the umbones; valves rather thick; beaks nearly terminal; cardinal tooth small; lateral tooth long and slightly curved; nacre pearly white.

Hab. Ohio. T. G. Lea.
My Cabinet.
Cabinet of T. G. Lea.
Cabinet of Prof. Vanuxem.

Diam. ·8, Length 1·4, Breadth 2·3 inches.

Shell compressed, wedge-shaped, ovate, broad and flat; substance of the shell thick anteriorly and thin posteriorly, showing the rays through it; beaks nearly terminal, slightly prominent, approaching, and when perfect possessing slight concentric undulations, generally decorticated; ligament not large, passing from the point of the beaks; epidermis yellowish brown, transversely wrinkled, marked with more or less broad interrupted rays, apparently formed of fasciculi of hair-like lines; cardinal tooth short, and but slightly elevated, in the left valve double and deeply cleft, in the right valve emerging from a pit; lateral tooth long and slightly curved; posterior cicatrices as well as anterior cicatrices distinct; the smaller posterior cicatrix situated against the lateral tooth at its termination; dorsal cicatrices on the under part of the cardinal tooth; cavity of the beaks not deep but rounded; nacre thick and milk white anteriorly, thin and iridescent posteriorly.

Remarks.—This species approaches closely to the *scalenia* of Rafinesque; its rays are of the same description, and the general form is the same. It is, however, more flattened, has much less elevated beaks, and its diameter is always much less. Its beaks are generally but little decorticated, and not recurved; the *scalenia* is generally much recurved and decorticated.

GENUS SYMPHYNOTA.

Testâ fluviatili, bivalvi; valvulis superné connatis.

Shell fluviatile, bivalve; valves connate at the dorsal margin.

Animal same as that of Unio.

Remarks.—Objections will most likely be made to the introduction of a new genus into a family acknowledged already to be in great confusion, and presenting many and various difficulties. The formation of the genus *Symphynota*, it is hoped, will rather be conducive to a diminution of that difficulty, by a division which all must acknowledge to be as natural as any of those of the family. The distinctive characteristic of this genus is the testaceous connection of the two valves of the shell above the hinge. I therefore remove from the existing genera all the connate shells without regard to the forms of their teeth, believing, that should this family be hereafter remodelled, it will present only two natural genera; one having a testaceous connection of the valves, the other dispossessed of it. The difficulties attending the adopted genera of the *Naïades*, viz. *Unio* of Bruguière, *Hyria*, *Anadonta*, *Iridina*, *Castalia** of Lamarck, *Dipsas* of Leach, and

* This genus was placed by Lamarck in the family *Trigonœa*, certainly with no propriety. It has been placed by Sowerby and Latreille among the *Naïades*,

Alasmodonta of Say, have been mentioned by two eminent English conchologists, W. Swainson and G. B. Sowerby, as well as in America by P. H. Nicklin. Mr Sowerby (Zool. Journ. Vol. I. p. 55.) has reunited them under the name of *Unio*, of which he makes two great divisions: 1. Without teeth. 2. With teeth; and these are each subdivided into "winged" and "not winged;" which are again divided into the various forms of teeth, or the "hinge line." The evident objection to this arrangement is the difficulty of deciding upon the passage from the "not winged" to the "winged." Thus we do not find the *Anodonta trapezialis* and *Anodonta glauca*, which Lamarck describes as "*compresso-alatâ*," mentioned among the "winged," while we have "*Anodon alatus* of Swainson and Lamarck," which is not described in the "Hist. Nat. des Animaux sans Vertebres*."

It is evident that the apparatus for depositing the calcareous and epidermal matter on the elevated and connected wing must be different from that of the inhabitant of free valves, to which it has been denied by nature.

Lamarck and Barnes both mention in their description of the *U. alatus* of Say, that M. Le Sueur thought this shell should constitute a new genus. Since that time so many connate shells have come to my notice, that I feel satisfied the science of conchology will be subserved by the institution of this natural genus, which will embrace, in all probability, several others, viz. *Hyria* of Lamarck, *Dipsas* of Leach, and *Cristaria*, *Prisodon*, and *Paxyodon* of Schumacher, all of which, when they shall be found perfect, will most probably turn out to be connate shells. Lamarck suspected his *Hyria* to be connate, like the *U. alatus;* for when describing that species, he says, "Nos *Hyries* auraient-elles une pareille réunion

and here must be considered as a species of Unio, and not a genus. The observant M. De Blainville has placed *Castalia* and *Hyria* among the *Uniones*, and *Iridina* and *Dipsas* among the *Anadontæ*. *Castalia ambigua* is undoubtedly a fluviatile shell, and approaches most closely to the *U. triangularis*. The teeth are those of the Unio, and it differs only in its longitudinal furrows from the general characters of the Unio.

* Say describes his *An. gibbosa* as being alated.

à la carène de leur corselet?" Indeed the fact can scarcely be doubted.

SPECIES.

1. Symphynota Lævissima. Plate XIII. fig. 23.

Testâ ovato-triangulari, inæquilaterali, transversim rugosâ, sub-ventricosâ; valvulis tenuissimis, superne bi-alatis, ante et post nates connatisque; dentibus cardinalibus et lateralibus lineam curvatam facientibus; natibus prominulis; ligamento celato; margaritâ purpureâ et iridescente.

Shell triangular-ovate, inequilateral, transversely wrinkled, sub-ventricose; valves very thin, elevated into two wings, connate anteriorly and posteriorly to the beaks; cardinal and lateral teeth form a curve line; beaks scarcely prominent; ligament concealed; nacre purple and iridescent.

Hab. Ohio. T. G. Lea.
My Cabinet.
Cabinet of T. G. Lea.
Cabinet of Prof. Vanuxem.
Cabinet of P. H. Nicklin.

Diam. 1·4 inch. Length from beaks to base, 2·4 inches.
Breadth 4·5 inches.
Length from the top of the wing to base, 3·1 inches.

Shell sub-triangular-ovate, inequilateral, sub-ventricose, transversely and very finely wrinkled, shining; substance of the shell thin, but compact; valves elevated into two wings, neither of them very high, the posterior one larger than the anterior, both connate; beaks scarcely prominent, termination pointed, and when not decorticated exhibit two or three very minute elevations, almost requiring a microscope to discover them; the purple nacre shows through the epidermis here, and gives the tips that colour; ligament concealed in the wing; sinus subquadrate; epidermis thin and purple brown; young specimens sometimes possess obscure brown rays; cardinal tooth lamelliform, *single in the left valve and disposed to*

be double in the right; lateral tooth lamelliform and double in the left valve only, the two teeth form one continuous curve line, somewhat abrupt at both terminations, more so at the anterior one; anterior cicatrices distinct; posterior cicatrices confluent; dorsal cicatrices very perceptible. Cavity of the beaks wide and very shallow; nacre purple and iridescent.

Remarks.—This beautiful shell most resembles the *Symphynota alata* in its general form, but its posterior wing is less elevated. The colour of its nacre is the same. It differs entirely, however, in the cardinal tooth, and in possessing the anterior connate wing. A metallic sound is produced by dropping one valve into the other, which is very remarkable, and is caused by the density of the calcareous matter of the nacre, which is very thin. The epidermis is exceedingly smooth and glossy.

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2. Symphynota Bi-alata. Plate XIV. fig. 24.

Testâ ovato-triangulari, inæquilaterali, transversim rugosâ, sub-ventricosâ; margine dorsali bi-alatâ; valvulis tenuibus, ante et post nates connatis; natibus et alæ posterioris basi apiceque undulatis; natibus haud prominentibus; dente lamelliformi unico in valvulâ utrâque; ligamento celato; margaritâ tenui et iridescente.

Shell triangular-ovate, inequilateral, transversely wrinkled, sub-ventricose; dorsal margin raised into two wings; valves thin, connate before and behind the beaks; beaks and the base and summit of the posterior wing undulated; beaks not prominent; one lamelliform curved tooth in each valve; ligament concealed; nacre thin, pearly, and iridescent.

Hab. . . . . fresh waters of the south of Asia? Brought from Canton by Captain Barr.

My Cabinet.
Cabinet of Mr Pierpoint.
Cabinet of Mr Hyde.
Cabinet of Mr Phillips.

Diam. 1 inch. Length from the beaks to the base, 2 inches. Breadth 3·6 inches.
Length from the top of wing to base, 3·4 inches.

Shell triangular-ovate, inequilateral, subventricose, transversely and finely wrinkled, shining; substance of the shell thin, showing the rays through it; valves elevated into a broad high wing posterior, and a small one, anterior to the beaks, and connate in both; beautifully undulated at the base and top of the posterior wing; undulations of the base commencing at the point of the beaks, pass on the outside of the tooth to the margin in a slightly curved line, each successive wave increasing in size and cutting the wrinkles of the epidermis obliquely; those of the top of the wing, when it is perfect, are about the same in number, but less elevated, and closer together; they cut the wrinkles at about the same angle; beaks not prominent, crowned with about six elliptical concentric undulations; ligament concealed in the wing; sinus formed by the end of the ligament, sub-quadrate; epidermis yellow and purple brown, with green oblique rays, finely wrinkled, smooth and shining; the wrinkles of the anterior wing, as they ascend the wing, are curved anteriorly and continuous over both wings; each valve furnished with a long, curved, lamelliform tooth, very small anteriorly to the beaks, larger and longer posteriorly, pointed at both ends; anterior cicatrices distinct; posterior cicatrices confluent; dorsal cicatrices situated in the cavity of the beaks, very perceptible; cavity of the beaks wide and very shallow; nacre thin, pearly, and iridescent, with tints of salmon, white and purple; the undulations very perceptible from the centre of the beaks along the base of the tooth to the posterior dorsal margin.

Remarks.—All the specimens which I have seen of this remarkable species were brought from Canton. The first was received by Mr Hyde about two years since, and then excited much interest with our conchologists. Several specimens more perfect were brought last summer in the "Caledonia;" and from these specimens the description has been

made. That of Mr Hyde is a large, old, and valuable specimen, but has lost some of its important characters. Both wings are destroyed, the beaks much eroded, and the epidermis black and much wrinkled, and the rays obsolete. The remarkable waves at the base of the posterior wing are almost obsolete, and the beauty of the nacre nearly destroyed by being thick and opake; cicatrices very perceptible. In this specimen, and I believe it will occur in all adult individuals, the only remains of the lamelliform tooth are in the termination of it under the ligament, about an inch long; the rest of it is lost in the callus of the dorsal margin. Its dimensions are

Diam. 2·1, Length 5·5, Breadth 7·1 inches.

In general form and character this species exteriorly resembles most the *Symphynota alata;* interiorly, except in colour, the *Symphynota lævissima*, herein described; the shape of the lamelliform tooth of which assimilates to it, with the exception of its being double. The teeth in both these species describe nearly the same arc and take the same position. Both species are alated anteriorly and posteriorly to the beaks. The *lævissima* differs in having no undulations, and possessing obsolete rays, double teeth, and purple nacre.

The *Dipsas plicatus* of Leach bears a strong resemblance to this shell. It differs, however, in the wings of the *D. plicatus* not being elevated, almost forming a line with the beaks, in the latter not being connate, and in not being crowned with undulations at the beaks. His description, however, is so short and defective, and the drawing evidently so badly executed, that I cannot determine in what other points it may differ.

Schumacher's *Cristaria tuberculata* bears a strong affinity to this species also, as well in his description as his plate. He describes and figures it, however, as being alated posteriorly, and not anteriorly, and does not mention its being connate. The fact of its possessing a divided lateral tooth, "callus parallelus bifidus," proves that it is not our species.

3. Symphynota Alata.

Testâ ovato-triangulari, transversim rugosâ, sub-compressâ; valvulis crassiusculis, earum marginibus dorsalibus alatis, et super ligamento connatis; dente cardinali in valvulis ambabus duplici, laterali in sinistrâ tantum duplici, subcurvato; ligamento sub alâ celato; natibus prominulis; margaritâ purpureâ.

Shell triangular-ovate, transversely wrinkled, rather compressed; valves moderately thick, elevated into a high wing, and connate over the ligament; beaks scarcely prominent; cardinal tooth double in both valves; lateral tooth double in the left valve only, and slightly curved; ligament concealed; nacre purple.

Hab. our western waters.

Unio alatus. Say. Nicholson's Encyclopædia (Am. Ed.) Art. Am. Conch. pl. 4, fig. 2.*

Unio alata. Lamarck.

Unio alatus. Barnes. Silliman's Am. Journ. Vol. VI.

Unio alata. Swainson.

Diam. 2, Length 4·7, Breadth, 6·9 inches.†

Remarks.—In young specimens it appears disposed to be connate anteriorly to the beaks also. The dorsal cicatrices form quite a row across the cavity.

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4. Symphynota Complanata.

Testâ ovato-triangulari, inæquilaterali, transversim rugosâ, compressâ; valvulis crassis; margine posteriori dorsali alatâ connatâque; dente unico cardinali in valvulâ utrâque; plano irregulari calloso sub ligamento; natibus compressis, sub-prominulis; ligamento celato; margaritâ albâ, iridescenti.

Shell triangular-ovate,‡ inequilateral, transversely wrinkled, com-

* This figure was made from an imperfect specimen, the wing being mutilated.

† See Barnes's description.

‡ Mr Barnes says "ovately quadrangular;" but the shell is evidently more triangular, as his figure displays it. *See Silliman's Am. Journ. Vol. VI. p.* 278.

pressed; valves thick; posterior dorsal margin winged and connate; a large cardinal tooth in each valve; an irregular callous plane under the ligament; beaks compressed and scarcely projecting; ligament concealed; nacre white and iridescent.

Hab. Fox River. Mr Schoolcraft.
Wisconsan. Captain Douglass.
Ohio. W. Cooper.
My Cabinet.
Cabinet of Mr Barnes.
Cabinet of Prof. Vanuxem.
Cabinet of the New York Lyceum.
Cabinet of Dr Mitchill.
Cabinet of the Academy of Natural Sciences.

Alasmodonta complanata. Barnes.

Diam. ·9—1·4 inches. Length from beaks to base, 3 inches. Breadth 5 inches.
Length from the top of the wing, 4·3—4·5 inches.*

Shell triangular-ovate, inequilateral, transversely wrinkled, compressed, the largest diameter being nearly 2-3ds of the distance from the beaks to the base; substance of the shell thick; valves elevated into a moderately sized wing over the ligament, and connate; this wing is traversed at right angles to the wrinkles, by obscure undulations reaching to the beaks; beaks much compressed and scarcely projecting, crowned by several double concentric undulations, which terminate in a point; ligament concealed in the wing; sinus subquadrate; epidermis dark brown and irregularly wrinkled; cardinal tooth thick, elevated, sulcated, and diverging from the beaks; a wide, irregular callous plane extends under the ligament; cicatrices in the anterior margin three, and irregular; in the posterior margin two, confluent and scarcely perceptible; dorsal cicatrices very perceptible; cavity of the beaks and disk small; nacre white and iridescent.

Remarks.—This shell, first described by Barnes, is a rare

* See Barnes's description; my specimen is rather more ventricose.

and beautiful species. It is peculiar in its very much compressed beaks, and in its greatest diameter being but a short distance above the basal margin.

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5. Symphynota Compressa. Plate XII. fig. 22.

Testâ transversim elongatâ, inæquilaterali, valde compressâ, ellipticâ; valvulis tenuibus; natibus sub-prominulis, undulatis; dente cardinali prominente; laterali parvo.

Shell transversely elongated, inequilateral, compressed, elliptical; valves thin; beaks scarcely prominent, undulated; cardinal tooth prominent; lateral tooth small.

Hab. { Ohio. T. G. Lea.
{ Norman's Kill, near Albany. Dr Eights.
My Cabinet.
Cabinet of Prof. Vanuxem.
Cabinet of Dr Eights.
Cabinet of P. H. Nicklin.
Cabinet of the Academy of Natural Sciences.
Cabinet of the New York Lyceum.

Diam. ·8, Length 1·7, Breadth 2·8 inches.

Shell transverse, much compressed, elliptical; substance of the shell rather thin; beaks slightly elevated, not decorticated, beautifully crowned with small double concentric undulations, points of the beaks almost white; ligament concealed within the valves; dorsal margin rather elevated posteriorly to the beaks; posterior margin sub-angular; posterior basal and basal margins curved; anterior and anterior dorsal and basal margins rounded; epidermis olive-green, slightly wrinkled and glabrous; radiations over the whole disk; cardinal tooth prominent and curved, in the left valve with three protuberances, the posterior the highest, sloping to the end of the lateral tooth, the anterior the lowest; in the right valve one rather large, which closes between the first and second of the left; lateral tooth short and nearly straight, passing from

the very point of the beaks, in the right valve lamellar near the termination, and abrupt; in the left acicular, the channel being only large enough to admit of the edge of a penknife; in the right valve the cardinal and lateral teeth are entirely separated by a cavity formed by the tooth of the other valve, this cavity is at the very point of the beak, and therefore the valve has little or no cavity; in the left valve the large recurved tooth forms a beautiful angular cavity; anterior cicatrices distinct; posterior cicatrices confluent; dorsal cicatrices situated at the point of the cavity of the beaks; cavity of the shell very shallow; nacre delicate salmon colour towards the beaks, bluish towards the margin.

Remarks.—This is a singular and beautiful shell. Its cardinal and lateral teeth are very remarkable. The first being high in the left valve over the cavity of the beak, while in the right it is there depressed; the latter is short and lamelliform at termination. The beaks are equally remarkable, being finely undulated; the epidermis is so thin and delicate as to give them almost a white appearance. The rays are broader and more full than in any shell I have seen; they diverge in all directions from the point of the beaks to the margin.

The specimen belonging to the cabinet of the New York Lyceum, was kindly sent for my inspection by W. Cooper, a member of that valuable institution. It was given by Dr Eights to Mr Barnes, and by the latter labelled "*U. alasmodontina.*" My description was written some years since, but remained unpublished until I should have an opportunity of examining other specimens.

6. Symphynota Gracilis.

Testâ sub-triangulari-ovatâ, inæquilaterali, transversim rugosâ, sub-compressâ; valvulis tenuibus fragilibusque; margine posteriori dorsali sub-alatâ, connatâque; dente cardinali in valvulâ dextrâ elevato, recurvo; natibus sub-prominulis; ligamento celato; margaritâ violaceo-purpureâ et iridescente.

Shell sub-triangular-ovate, inequilateral, transversely wrinkled, rather compressed; valves thin and fragile; posterior dorsal margin connate, wing but little elevated; cardinal tooth of right valve elevated, recurved; beaks scarcely prominent; ligament concealed; nacre pearly, violet-purple, and iridescent.

Hab. { Ohio. T. G. Lea.
Wisconsan. Mr Schoolcraft.
My Cabinet.
Cabinet of Mr Barnes.
Cabinet of Prof. Vanuxem.
Cabinet of P. H. Nicklin.
Cabinet of Mr Swainson.
Cabinet of the New York Lyceum.
Cabinet of the Academy of Natural Sciences.

Unio gracilis. Barnes. Silliman's Amer. Journ. Vol. VI. p. 174.

Unio fragilis. Swainson*.

Unio planus. Barnes.

Diam. 1—1·2, Length 2·2—2·5 inches.
Breadth 3·1—4·1 inches†.

Shell sub-triangular-ovate, inequilateral, transversely wrinkled, rather compressed; substance of the shell thin; valves elevated into a small wing over the ligament and connate; beaks slightly prominent, pointed, having two or three minute elevations; ligament concealed in the wing; epidermis yellow-

* I have retained the specific name of Mr Barnes in preference to that of Mr Swainson in the right of priority. Mr B. published in January 1823. Mr S.'s dedication of 3d vol. of his Zool. Illus., in which the *fragilis* is described, is dated Oct. 1823.

† See Barnes's description.

green, finely wrinkled, obscurely radiated and glabrous; marks of growth very perceptible; cardinal tooth of right valve crest-like, recurved, and clasping the side of the opposite one; lateral teeth lamelliform and curved; anterior cicatrices distinct; posterior cicatrices confluent; dorsal cicatrices form a line across the cavity of the beaks, and are very perceptible; cavity of the beaks very wide and shallow; nacre pearly, bluish-white, violet-purple and iridescent.

Remarks.—Mr Barnes noticed this as a connate shell. His description of the cardinal tooth does not agree with my specimens, except in the younger ones, in which this tooth is more lamellar. The recurved tooth hooking or clasping the other, when the valves are closed, is very remarkable.

In some specimens the lateral and cardinal teeth form an uninterrupted curve line, when the cardinal tooth is quite lamelliform; in others the latter is small and lobed, age producing much effect on it in this respect.

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7. Symphynota Tenuissima. Plate XI. fig. 21.

Testâ angusto-ellipticâ, inæquilaterali, transversim rugosâ, compressâ; valvulis tenuissimis fragillimisque; margine dorsali connatâ; dente cardinali prominentiâ exiguâ, laterali unico et aciculari in valvulâ utrâque; natibus depressis; ligamento celato; margaritâ cæruleo-albâ et purpureâ, iridescente.

Shell narrow-elliptical, inequilateral, transversely wrinkled, compressed; valves very thin and very fragile; dorsal margin connate; cardinal tooth a small lobe; lateral tooth acicular and single in both valves; beaks depressed; ligament concealed; nacre bluish-white and purple, iridescent.

Hab. Ohio. T. G. Lea.
My Cabinet.
Cabinet of T. G. Lea.
Cabinet of Prof. Vanuxem.
Cabinet of P. H. Nicklin.

Diam. ·6, Length 2·2, Breadth 2·5 inches.

Shell narrow-elliptical, inequilateral, transversely wrinkled, much compressed; substance of the shell very thin; valves connate over the ligament, and not elevated into a wing; beaks scarcely prominent, pointed, nearly terminal; epidermis wrinkled, yellow, with very oblique green rays, which, when apparent, give a greenish hue to the shell; rays more numerous and perceptible along the umbonial slope; marks of growth very perceptible; greatest diameter along the umbonial slope; cardinal tooth of right valve a small lobe closing into a depression of the margin of the left valve; lateral teeth acicular, single in both valves, and nearly or quite direct; anterior cicatrices distinct; posterior cicatrices confluent; dorsal cicatrices form a line across the cavity of the beaks, and are very perceptible; cavity of the beaks scarcely apparent; nacre bluish-white, purple about the region of the teeth and the cavity of the beaks.

Remarks.—This interesting species is the most fragile and thin of all the family of the *Naïades* which I have seen. The epidermis seems in some specimens to prevail over the substance of the shell, which is so extremely brittle as almost to be destroyed in our cabinets by its contraction from the effect of the atmosphere. The beaks are so nearly terminal that it somewhat resembles the *modiola* in this respect. It is the nearest approach to the *Anodonta*, having but the rudiments of teeth; and I am much disposed to believe that the "*Anodon purpurascens*" of Swainson is analogous to this shell. He had seen but one perfect specimen sent him by Mr Rafinesque from the "back settlements." I have seen many specimens of the *tenuissima*, all of which have the rudiments of the cardinal and lateral teeth. This shell exhibits to us the necessity of resorting to a more natural definite division of *Naïades* than that of the teeth. The *tenuissima* resembles most the *gracilis*. They differ, however, in the latter being much larger, more ovate, heavier, more ventricose, and not radiate. The teeth of the *gracilis* are well defined, which is not the case with this.

8. Symphynota Ochracea.

Testâ sub-ovatâ, inæquilaterali, transversim rugosâ, inflatâ; valvulis post ligamentum connatis, tenuibus, fragilibus, et sine alâ; dentibus cardinalibus et lateralibus curvam lineam facientibus; natibus prominentibus; ligamento conspicuo; margaritâ cæruleo-albâ et ochraceâ.

Shell sub-ovate, inequilateral, transversely wrinkled, inflated; valves thin and fragile, connate *behind* the ligament, not winged; cardinal and lateral teeth forming a curve line; beaks prominent; ligament visible; nacre bluish-white and ochraceous.

Hab. Schuylkill and Delaware.
My Cabinet.
Cabinet of Mr Say.
Cabinet of Prof. Vanuxem.
Cabinet of Mr Hyde.
Cabinet of the Academy of Natural Sciences.
Cabinet of Dr Griffith.
Cabinet of P. H. Nicklin.
Peale's Museum.

Unio ochraceus. Say. Nicholson's Encyclopædia, Art. Am. Conchol. pl. 2, fig. 8.

Diam. 1·3, Length 1·9, Breadth 2·9 inches.

Shell sub-ovate, inequilateral, transversely wrinkled, inflated; dorsal margin rectilinear; valves thin and fragile, connate *behind* the ligament, not winged; beaks full and prominent, with several concentric undulations; *ligament not concealed;* epidermis glossy, varying from yellow ochre to brown ochre, marked with oblique rays, most abundant behind; cardinal and lateral teeth lamelliform, forming a curve line, in the *right* valve the cardinal tooth is double, in the *left* single; anterior cicatrices distinct; posterior cicatrices confluent; dorsal cicatrices form a row across the cavity of the beaks, very perceptible; cavity of the beaks large; nacre bluish-white and ochraceous; along the anterior basal margin thicker and tinged with red; posterior margin iridescent.

Remarks.—This is a beautiful shell. It is remarkable in being connate behind the ligament; this connection, however, is very small, and only perceptible in perfect specimens; in the old ones it is separated. Fine specimens have been in our cabinets for years without our observing they were connate. The cardinal tooth being double in the right valve seems to have escaped the attention of the observant Mr Say.

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9. Symphynota Cygnea.

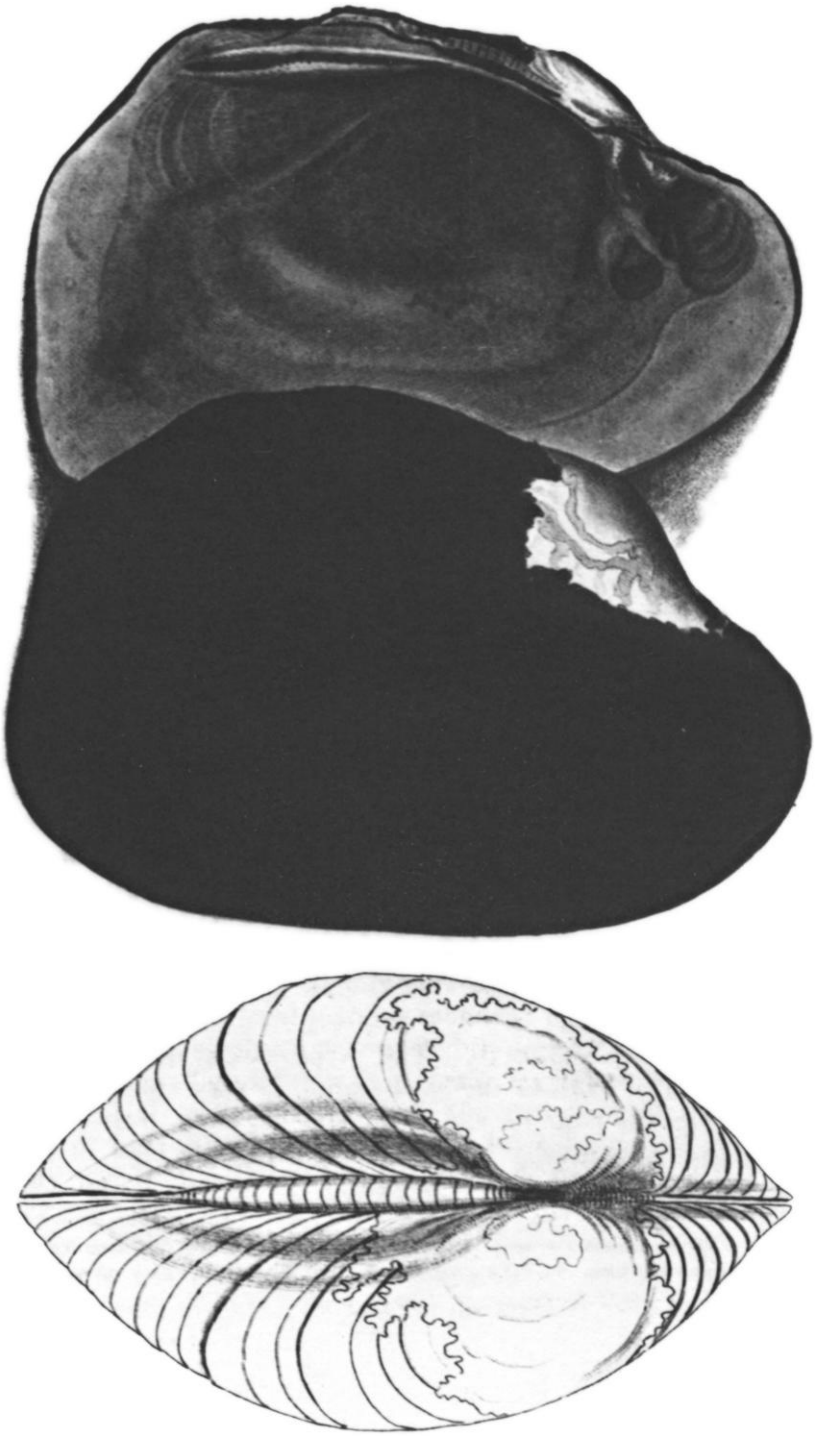
Testâ ovatâ, antice latâ et rotundatâ, irregulariter transversim rugosâ; natibus retusis; valvulis tenuibus et post ligamentum connatis.

Shell ovate, wide before and round, with irregular transverse wrinkles; beaks not prominent; valves thin and connate behind the ligament.

Hab. rivers and lakes of Europe.
My Cabinet.
Mytilus cygneus. Lin. Gmel. p. 3555.
Anodonta cygnea. Lam.

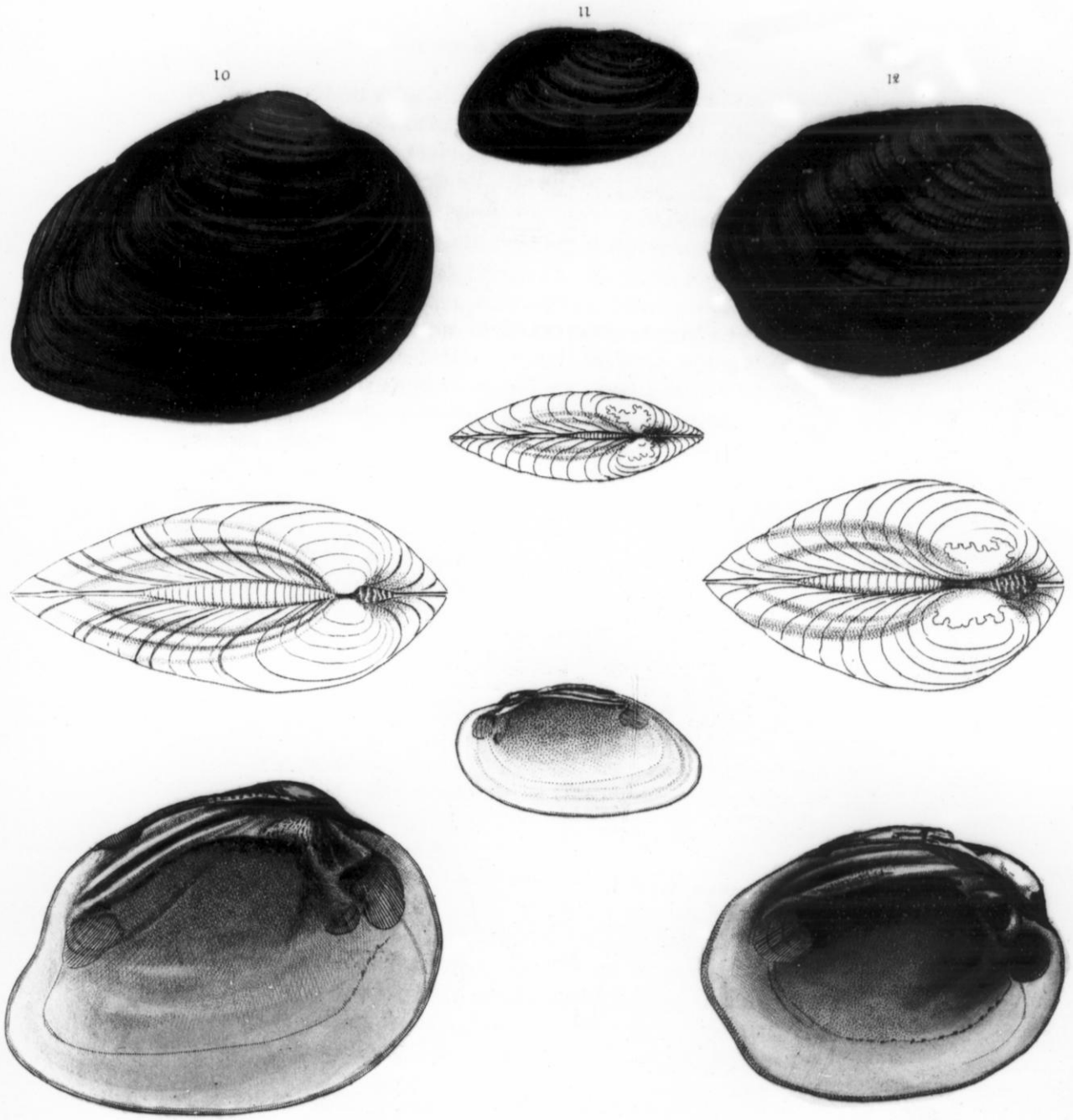
Remarks.—It is a matter of surprize to me that this shell, so long known and so often described by European conchologists, should not have been before observed to be connate. It has not to my knowledge been thus described. Among about a dozen specimens received from various parts of Europe, I have two which are decidedly and undoubtedly connate. One was sent to me by Count de Yoldi of Copenhagen, the other by W. Swainson, Esq. of London. These are the only specimens I have seen with the dorsal margin unfractured, and it may be that even in their native beds they rarely exist in a perfect state with regard to this part. Young specimens would be more likely to be found perfect, if taken from pools or lakes where they remain undisturbed by the attrition of sand, &c. carried over them by the action of the water.

In closing this paper, I take the opportunity of returning my thanks to those friends who have kindly loaned me their specimens for examination and comparison, and by whose advice I have frequently profited. To P. H. Nicklin, Esq. I feel under peculiar obligations for frequent consultations and assistance; and to W. Cooper, Esq. I am greatly indebted for the opportunity, through his means, of having in my possession for some weeks the identical specimens appertaining to various valuable cabinets in New York, from which Mr Barnes made his descriptions.



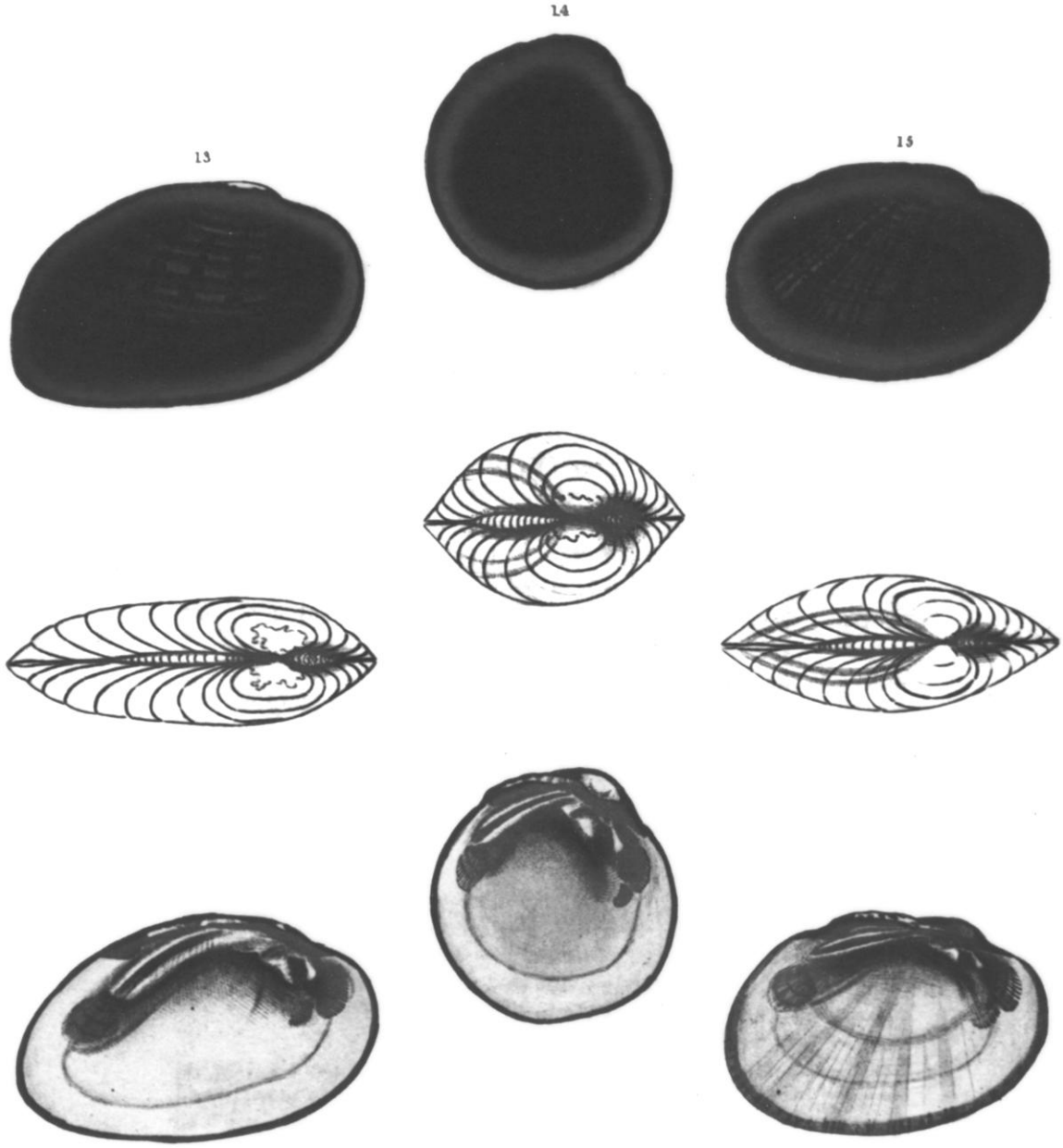
Unio ater

Drawn & Engd by J. Drayton



Unio rubiginosus. *Unio heterodon.* *Unio sulcatus.*

Drawn & Engd by J.Drayton



Unio planulatus. *Unio circulus.* *Unio multiradiatus.*

Drawn & Engᵈ by J. Dreyhus.

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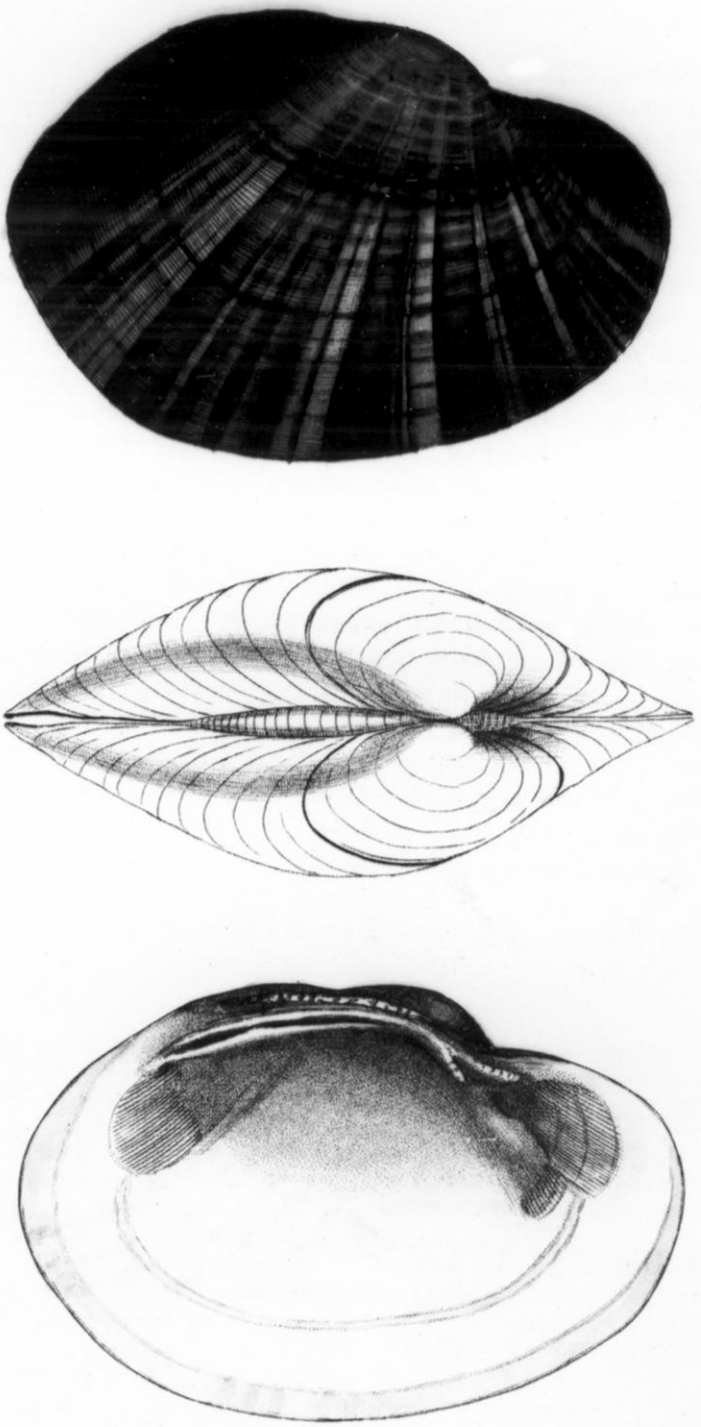
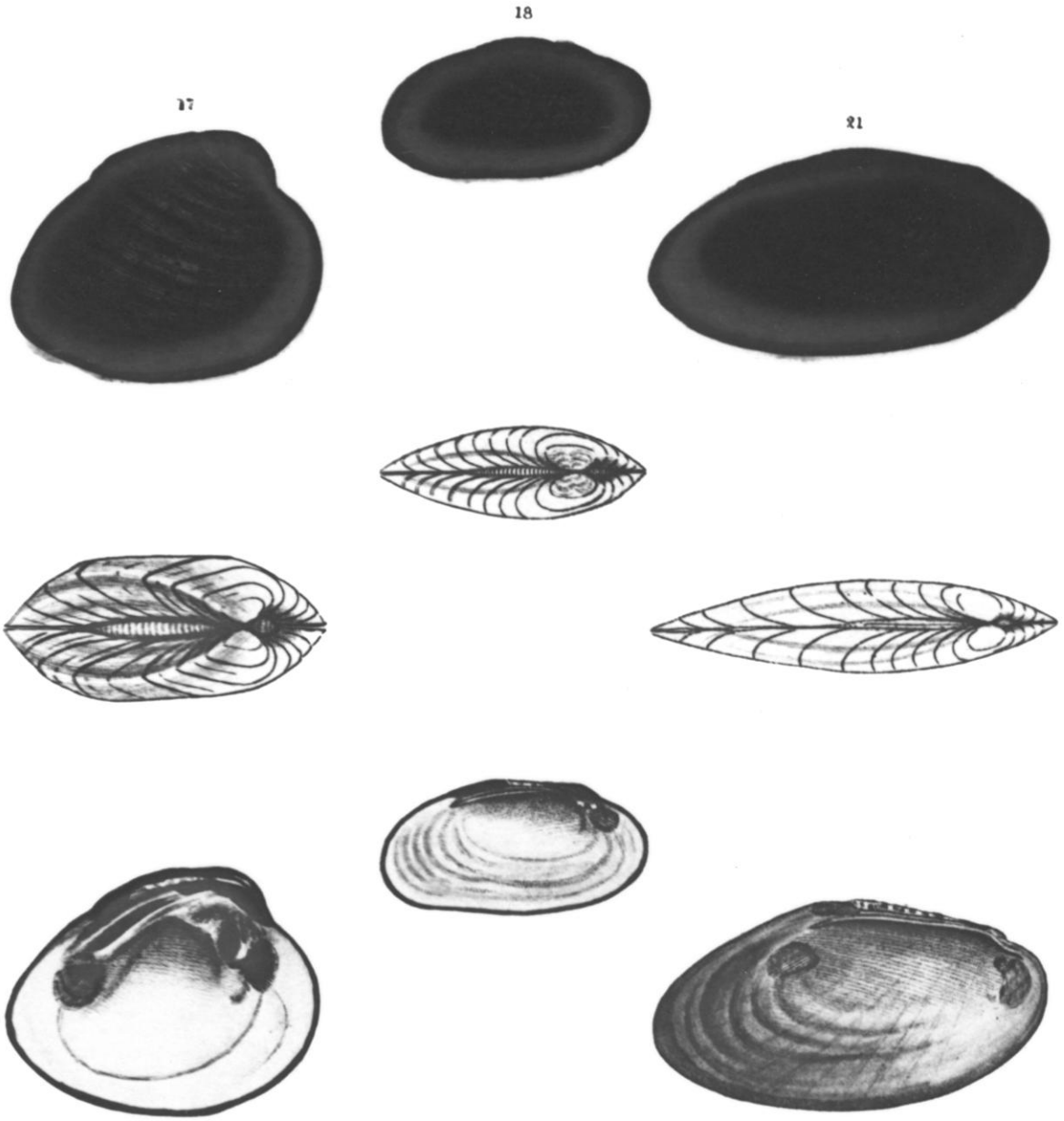


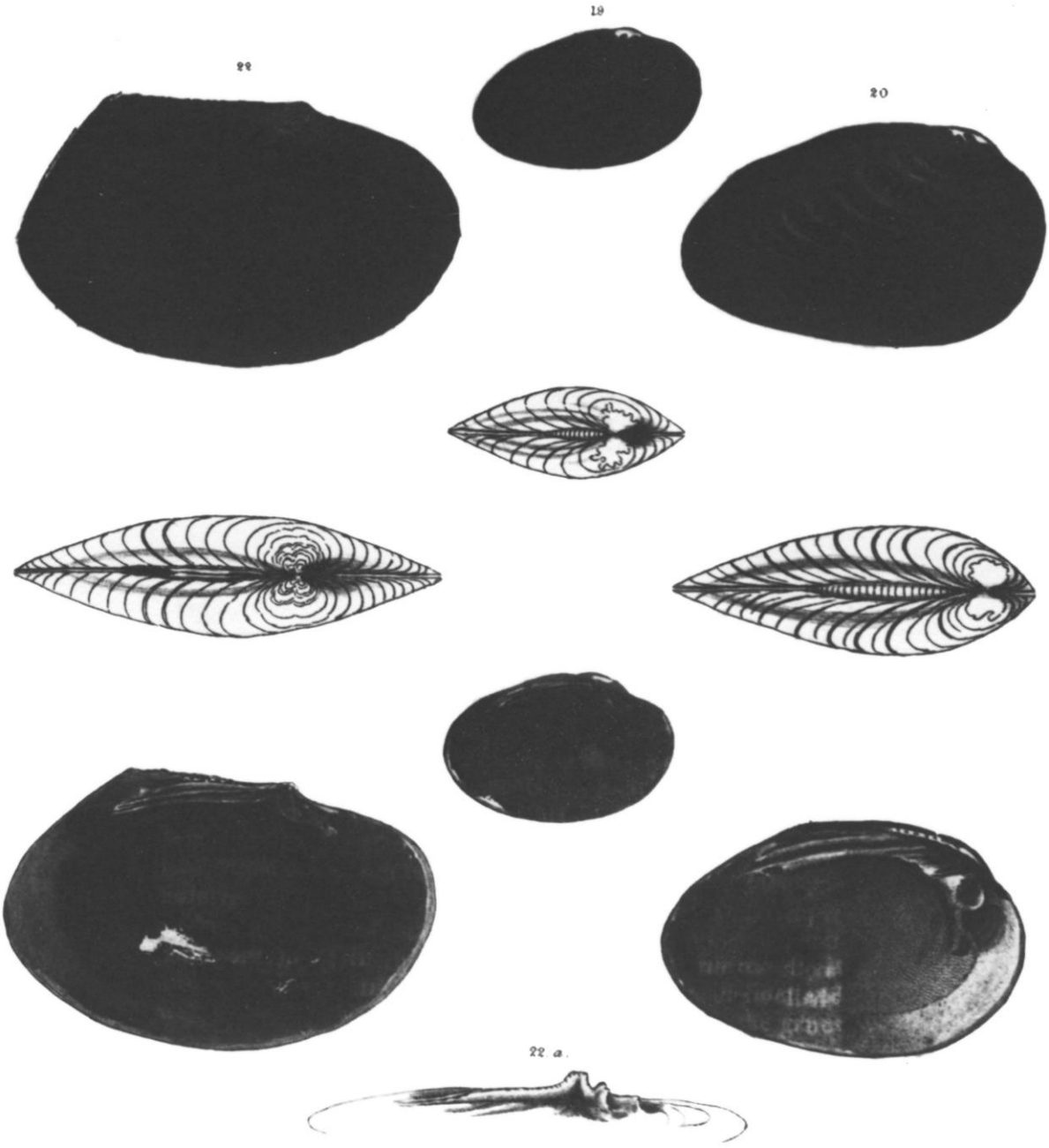
Unio occidens.

Drawn & Eng'd by J.Drayton.



Unio securis *Unio iris* *Symphynota tenuissima.*

Drawn & Eng'd by J.Dreyer.

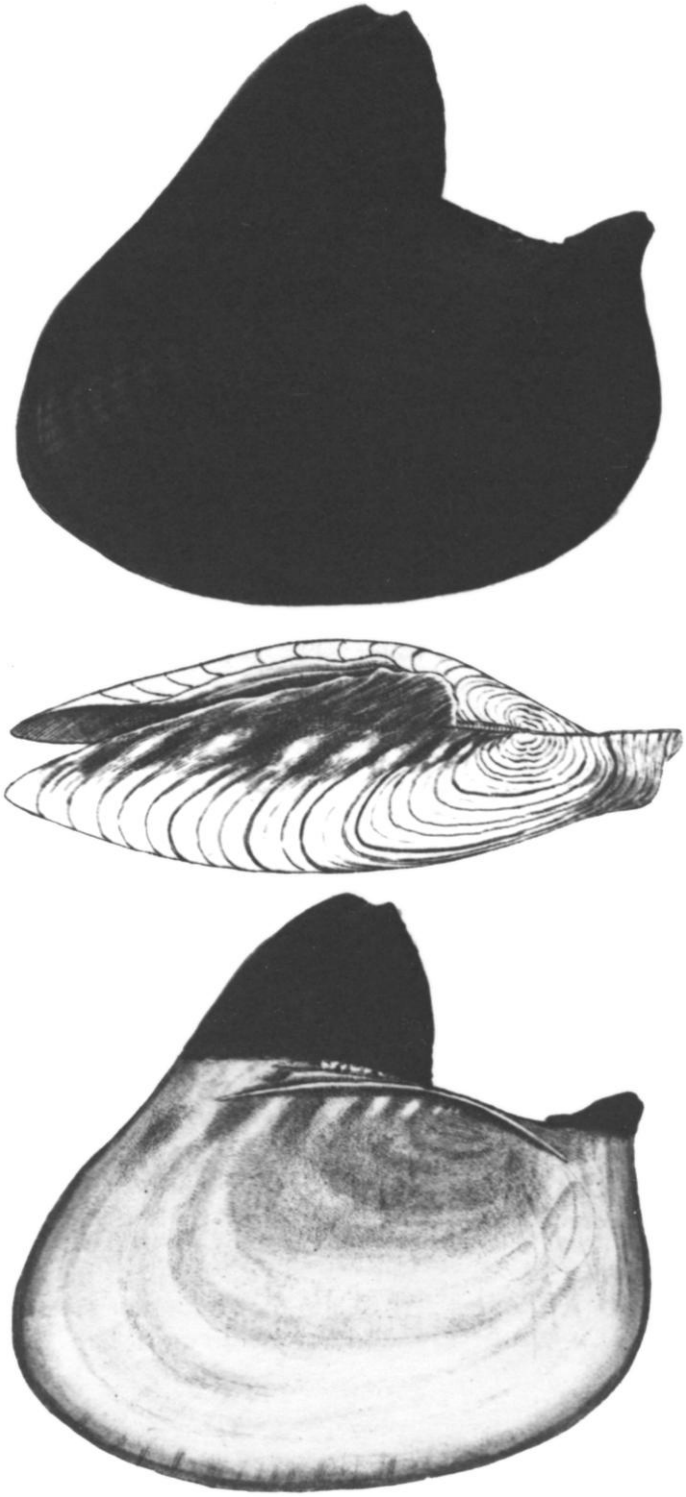


Symphynota compressa. *Unio zig-zag.* *Unio patulus.*

Drawn & Eng'd by J.Drayton.

Symphynota Levissima

Drawn & Engr'd by J.Draytn.



Symphynota bi-alata.

Drawn & Eng'd by J. Drayton.